VOL. 47 NOVEMBER 1921 No. 225

Engineering Library

United States Naval Institute Proceedings

The writers only are responsible for the contents of their respective articles

CONTENTS

	PAGE
Use of Aircraft in Naval Warfare.—Cummings	1677
The Salvage of the "Leonardo da Vinci."—Guidoni	1689
Rigid Airships.—Fulton	1697
The Naval Officer and the Civilian.—Stevens	1725
Yap.—Allen	1741
Across the Continent With an Insane Man.—Coontz	1749
The Study of History for Naval Officers.—Mayo	1755
T=C—W.—Van de Carr	1763
Tactical and Fire Concentration Problems and Their Solutions.—Hill	1765
A Solution of the Officer Personnel Situation.—Blasdel	1779
Secretary's Notes	1787
Professional Notes	1791
Notes on International Affairs	1847
Information Index	1789

Copyright, 1921, by J. W. Conroy, Trustee for U. S. Naval Institute

Entered at the Post Office at Annapolis, Maryland, as Second Class Matter

See Special Supplement immediately inside of cover, containing:
The Relative Importance of the Philippines and Guam.—Fiske....Page 1676[1]
Sea-Power: The Senate and the Air.—Moran.....Page 1676[4]

WORLD'S ONLY MAKER

Moulded High Frequency High Tension Insulators

POTENTIALS 1,000 ← TO → 1,000,000 VOLTS

Medal and Diploma received at World's Columbian Exposition, Chicago, 1893

TRADE ELECTROSE MARK REG. U.S. PAT. OFF. & FOREIGN COUNTRIES.

Medal and Diploma received at World's Fair, St. Louis, 1904

INSULATION
MADE IN AMERICA

Louis Steinberger's Patents

ARRIVED

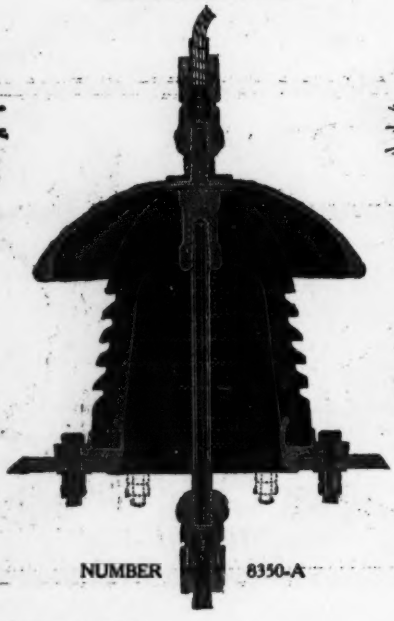
TRADE ELECTROSE MARK REG. U.S. PAT. OFF. & FOREIGN COUNTRIES.

AIR-GAP TYPE INSULATORS

PATENTED

Radio Frequencies
Radio Telegraph
Radio Telephony
X-Ray Apparatus
Damped or Sustained Voltages
Air Gap ¼" and Upward

Maximum Dielectric Strength



NUMBER 8350-A

ARRIVED

TRADE ELECTROSE MARK REG. U.S. PAT. OFF. & FOREIGN COUNTRIES.

AIR-GAP TYPE INSULATORS

PATENTED

Audio Frequencies
Transmission Lines
Sub Station Bushings
Transformer Bushings
Oil Switches
Circuit Breakers, Etc.
Air Gap ¼" and Upward

Maximum Mechanical Strength

MINIMUM DIELECTRIC LOSS **MINIMUM COST**
MINIMUM WEIGHT **MINIMUM PHYSICAL DIMENSIONS**

Materials so proportioned that:

MAXIMUM ELECTRIC STRESSES FORMED IN AIR

EXTENSIVE TESTS under sustained radio frequency operation show:

NO DETECTABLE HEATING

ARC-OVER ESTABLISHED IN AIR

"ELECTROSE" Insulators are standard with United States Navy and Army and Wireless Telegraph and Telephone Companies.

"ELECTROSE" is made in a number of grades for various requirements, each grade possessing special characteristics.

"ELECTROSE" Insulators—Best in the World for High Frequency Currents, Power and Transmission Circuits.

SOLE MANUFACTURERS

ELECTROSE MFG. CO.

60-82 Washington St. 27-37 York St.
66-76 Front St. 1-23 Flint St.
Brooklyn, N. Y., America

SPECIAL SUPPLEMENT

United States Naval Institute Proceedings
No. 225, November, 1921

THE RELATIVE IMPORTANCE OF THE PHILIPPINES AND GUAM

By Rear Admiral Bradley A. Fiske, U. S. Navy

AND

SEA-POWER: THE SENATE AND THE AIR

By Cyril Godfrey Moran

NOTE—These articles were not received in time to be included in the regular pagination of this issue, but are considered of such importance that the mailing has been delayed in order that they might be bound in as a supplement.

COPYRIGHT, 1921

By J. W. CONROY

TRUSTEE FOR U. S. NAVAL INSTITUTE

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE RELATIVE IMPORTANCE OF THE PHILIPPINES AND GUAM

By Rear Admiral Bradley A. Fiske, U. S. Navy

During the last ten years, and especially during the last few months, a great deal has appeared in print from the pens of navy officers and others, concerning the strategic situation in the Pacific Ocean. In virtually every writing that has appeared, the importance of Guam has been called to the attention of the reader: but only casual mention has been made of the Philippines, and very little realization manifested that they possess any strategic importance worth considering.

In the chapter on "Naval Bases" in my book, "The Navy as a Fighting Machine," page 322, is the paragraph "Mahan states that the three main requirements of a naval base are position, resources and strength: and of these he considers that position is the most important; largely because resources and strength can be artificially supplied, while position is the gift of nature, and cannot be moved or changed."

Now the book itself was published more than five years ago, and Mahan's declaration had been made some years before. The opinion expressed has never been challenged to my knowledge. It seems, in fact, to have been definitely accepted.

Let us see how the Philippines and Guam compare, if measured by each one of these standards.

1. *Position.*—From pages 327 and 328 of the book just mentioned, I beg leave to quote the following sentences: "The whole usefulness of bases is due to their ability to put fleets into good fighting condition and maintain them in it. This shows the advantage of having a base as close to the place where a fight is going to happen as may be possible. . . . It merely means that the closer the base is to the scene of operations or the actual battle, the

better 'tuned up' the personnel and material will be. It also means that this consideration is of the highest practical importance."

This paragraph enunciated no new principle. I mention it merely to call it to the attention of the reader, and to add a definite statement that the principle was stated in a well-known book five years ago, and has never to my knowledge been controverted or even questioned.

On the assumption that the principle is correct, it must be manifest that the Philippines are much superior to Guam in position; for the reason that they are much "closer to the scene of operations, or the actual battle": because, although we do not expect that any war is going to happen in the Pacific, yet if it does, the scene of probable operations can hardly fail to be the general vicinity of Formosa and Japan; unless, indeed, it be in the waters of the Philippines themselves.

2. *Resources.*—The Philippines cover an area of about 115,000 square miles and Guam an area of about 210 square miles. As there seems no reason to believe that the soil of the Philippines is less rich in natural resources than that of Guam, it follows that the natural resources of the Philippines must be at least five hundred times as great as those of Guam; using the expression "natural resources" in the accepted way, to mean the vegetable and mineral products of the soil. In the matter of what we may call "naval resources" (the resources needed to maintain a fleet, such as sheltered harbors of deep water, suitable places for docks and wharves), the ratio cannot be determined with exactness; but, since Guam has merely the exposed and contracted harbor of Apra, while the Philippines have scores of large harbors of deep and quiet water, it is clear that these resources also are much greater than those of Guam.

3. *Strength.*—The word strength, as applied to a naval base, could hardly have had any other meaning in the mind of Mahan than that in which it is usually applied to bases like Gibraltar: *i. e.*, ability to prevent capture. Here, also, the Philippines seem superior to Guam. Surely it would be more difficult to capture them than to capture Guam. It would necessitate a greater effort, and cost more in money, men and time.

Looking at the question somewhat more generally, we can see that the Philippines, by reason of their contiguity to the coast of a great land about to be developed (China), and by reason of lying

on the flank of all vessels passing from the Mediterranean to China and Japan and back, have a strategic importance in a highly important area, of the utmost possible value, and one that will increase as the years go by. And while it is true that Guam will always have a considerable strategic importance, because of its contiguity to the routes between the west coast of the United States and the Philippines, yet those routes are merely between the United States and the Philippines; whereas the trade routes that pass the Philippines lie between *all* the great countries of Europe and *all* the great countries of Asia.

Yet most navy officers and others who write on naval strategy wax eloquent in speaking of the value of Guam and almost ignore the Philippines! Why is this? Some may answer that the writers presume that the importance of the Philippines is so well understood that it is not necessary to speak of it. But this is not so: the importance of the Philippines seems not understood at all, if one is to judge by what is written and spoken and *done* about it.

Probably the reason is that the non-realization of many people of the ability of the airplane to prevent the actual invasion of the Philippines brought them to believe that the Philippines could be taken at any time: and that this belief gradually became "*une idée fixe.*" Now, *une idée fixe* in important matters is a dangerous thing; because it remains *fixe,* even when the persons entertaining it know that the conditions which originated it have departed.

Has not the time arrived to shake off the manacles of this *idée fixe?* The Philippines can be defended without great cost or labor, and they are even more important than Guam or Yap.

Surely this question is important enough to demand the most serious thought. No more important question is before the United States; none more imperatively demands the proper answer.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SEA-POWER: THE SENATE AND THE AIR

By CYRIL GODFREY MORAN

I

The results of the bombing experiments on the ex-German warships by army and navy aviators, however far reaching and ramified their effect, are at the outset rather discouraging to the onlooker interested in the political future of the United States, who is alive as well to the necessarily important rôle our navy will play in it.

They have furnished to date quantities of hot material to ill-informed newspaper correspondents, worse informed legislators and certain officers in the service of the United States who have employed more of enthusiasm than the light of cold reason in their arrival at conclusions, in their statements to the press and in published writings.

On such a broad stage was the contest set, with properties dramatic as the airman and the ghosts of an enemy naval power, the foreordained result could not but be spectacular. Now snap judgment and the hasty decisions of the popular mind are its dangerous concomitant.

When action on these decisions is pursued on the floors of our Congress by men fortified in the consciousness of their duty to effect the economies of which this country stands so much in need, their perseverance may well involve the military, especially naval forces in a disaster that will strike at the very heart of national defense; may, in the emergency when moments are priceless, cause the irreparable loss of lives and territory and leave a breach into which billions will be tossed in an effort to expiate the shortsightedness and questionable economies of the present.

The press in the past few months relates repeated efforts to suspend, in the interests of economy, construction on all new battleships and battle-cruisers. That overridden, another move to stop building on all that are below a certain per cent completed was

attempted. Now, following the "victory of the air," fervid in their latest conversion, the senate of the United States has for its consideration still another measure to provide for the conversion of three embryonic battle-cruisers into airplane carriers, with the stoppage of construction on the remaining three in addition to suspension of work on six super-dreadnoughts.

This is by way of meeting Secretary Denby, who with more weight than his word carried several months ago, before the bombing tests, is requesting a special appropriation of thirty millions from Congress to build an airplane carrier. Provision for two such vessels was thrown out by the House of Representatives in the Naval Appropriations Bill for the ensuing year, ending July 1, 1922. It may be noted that this bill was passed immediately prior to the sinking of the ex-German cruiser *Frankfurt* and the battleship *Ostfriesland*. As far as the Senate and House's limited technical understanding serves them, they are now vaguely apprehensive at the ostensible outcome of the tests and the quick confutation that seems to have assailed their cheap frugalities.

Noting the trend of the time and public interest they clamor now for the carrier. But blind still to the fundamentals of naval strategy, the uproar is at the expense of our most vital naval need—the battle-cruiser; and the last bill, introduced by Senator King of Utah, robs Peter to pay Paul but the half.

On the necessity of the battle-cruiser to the modern fighting fleet and its function, we will dwell later. Suffice it to say here that we have been more than five years getting the six that are authorized, they are still far from realization; yet they have been the object of consistent and bitter attacks by legislators, who seem to have singled them out as particular targets in their philippics against "The 1916 Program." (Which, whatever its mistakes, is one of our few progressive steps in the embodiment of a sound and broad naval policy.)

The disarmament conference, erroneous conclusions drawn from the bombing tests and the reaction of public opinion against the capital ship, tends in a dangerous degree to undermine the navy's defensive structure. The situation is no less than critical when the well being—possibly the future—of the service vacillates in the balance, subverted to the decisions of those hasty and untrained judgments who unfortunately have a large and altogether too detailed voice in the development of measures for national defense.

Carried away by the ideal of disarmament or by popular concession to a widespread misapprehension, they are being led to the committing of national indiscretions that will react perhaps heavily to our disadvantage in a future emergency.

To Senators Borah, of Idaho, and King, of Utah, is generally conceded the leadership in the fight against the continuance of capital ship construction, the completion of the 1916 program, and so on down the line to total disarmament.

To these men, personally, it is impossible to impute anything but the highest motives. They are actuated, doubtless, by the greatest sincerity and desire of service; the one pursuing his ephemeral vision of an everlasting world peace, the other supported by a conscientious effort to develop what appears to him a modern navy. Neither of them, however, are technically trained, and, lacking this specialization of their subject, are incapable of dictating in any military measure, policy or a detailed program of matériel. They are forced to accept in whole or in part the dicta or opinion of others more in touch with the matter, whose views for the time may be swayed by the detonation of a bomb on an abandoned hulk or who are accepting as postulates the empirical assumptions of air proponents.

Senator King in his long speech before the Senate last spring advocating suspension of naval construction, made no less than five misstatements in his opening remarks. They were important in that he was then reviewing the past administration of the service, resolving it to the present for disparaging comparison; and in all but one instance the statements directly or indirectly supported the logic of his disapproval. These departures in no way reflect on the senator's veracity; they are more an earnest of ignorance of subject. On the other hand they directly impugn the reliability of his sources of information and lay his conclusions, however ably drawn, open to serious question. In justice to Mr. King, however, be it said that his stand in the same speech on the disappointing results of our submarine program is well founded, and his effort to improve the present wretched condition of that service worthy of attention and support.

The Senate is here left to its discussions and we proceed to analysis of the airplane and the capital ship; weigh their functions, consider their comparative value, their necessary correlation and the place of each in the strategic plan of a naval operation.

II

Before going further the writer submits that the spirit of this discussion is not an opposition to air. On the contrary air's proper recognition as a factor in offense and defense, and its development within the physical limitations of its performance, is heartily urged. Its present menace (or usefulness if you will) and potentialities are fully recognized. But its sweeping adoption at the expense of the more stable, the tried machinery of naval warfare is from the soundest practical sources, decidedly condemned.

In the proposed substitution of the airplane carrier for the battle-cruiser, to the latter is assigned a distinct tactical function that can neither be usurped nor superseded by the former; each in their design present dissimilar characteristics of strength and weakness that will, as far as the plan goes, keep them widely separated in a fleet engagement.

The carrier is cut to Admiral Lord Fisher's rule; "Speed is armor." Her speed is her defense, her planes her offense. The battle-cruiser's offensive arm is the big gun; speed is likewise her defense. Because of the requirement of speed and sea-worthiness, both are large, the largest units of a fleet. Therefore, the equality of speed and inferiority of gun-power renders the carrier the particular prey of the battle-cruiser, or conversely the battle-cruiser is the best defense against the operation of the carrier, ship for ship. In the judicious provision for the carrier, it is axiomatic that the battle-cruiser, as a form of capital ship, must be retained in the strategy of a naval power for its protection. In detached operations the enemy battle-cruiser is the logical attack that may be looked for against it.

The function of the airplane carrier is, in the vessel itself, of a defensive order; that of the battle-cruiser, essentially offensive. The cruiser, aside from its duties at the head of the battle column maintaining contact between its own and the enemy's fleet, for rapid concentrations of force and the execution of possible enveloping movements in a general action, is also for the destruction of enemy commerce. This latter duty may involve the annihilation of their protective cruiser patrols, the sinking of their merchant ships, or simply driving them into port and off the seas as a most effective way of paralyzing their communications and strangling their resources for making war. Moreover, the battle-cruiser serves as protection to its own sea-borne trade in that it is

the only type swift and powerful enough to overtake and destroy the enemy battle-cruiser, supporting perhaps light cruiser raiding squadrons, and put a stop to his depredations, maintaining international credits and feeding the country with the vital necessities for prosecuting the war on which they may be engaged.

Among world powers, all of the potential enemies of the United States are better equipped with this type of vessel than we will be in ten years. The very fact of the possession of battle-cruisers by powers whose world interests may in future conflict with ours is an all-sufficient *raison d'être* for the retention and completion of those projected in our own program. Additional battleships, at this unstable period in naval design, can perhaps be dispensed with profitably, but the airplane carrier and the battle-cruiser are to this country a politic necessity before we shall subscribe to a naval holiday. It will be a critical step in our position as a naval power with major world interests, to vitiate a now too-meager force of the latter type.

For the purpose of speed in realizing an air defense program it may be expedient and the part of wisdom to sacrifice one or possibly two of the least completed battle-cruisers for conversion into airplane carriers, but this idea should not be entertained without the certainty of others of the latest design being immediately laid down and their construction expedited to replace them. These vessels are tremendous works of naval architecture and engineering and cannot be built in a day. Haggling as we are over penny economies may postpone their completion until the crisis when a minute is worth the year, and, realizing their need and our folly, we will pay with pounds.

There would be but little actual economy, as claimed, in converting the cruiser at this stage, the cost being all out of proportion to the advantage, and the necessary limitations of the carrier resulting from the change would be little profit for the labor, the time and the concessions.

It is not irrelevant to note here that at the outbreak of the war, Germany with thirteen commerce raiders spread over the seas of the world, ranging from light cruisers to armed liners, fully and exclusively occupied the attention of no less than seventy Allied warships in the several months before they were captured, driven into port or destroyed. England, who undertook the protection of the majority of the world trade-routes, was at times in extreme

straits with the utmost help her Allies could render, for lack of sufficient cruisers for this work. Her own battle-cruisers, possessing a slight preponderance over Germany's in weight and number, were kept closely confined in home waters for the express purpose of preventing the enemy from getting to sea and wreaking havoc with Allied trade. Although two were diverted for a time to South American waters subsequent to Cradock's defeat at Coronel, it was done only under dire necessity and with the greatest secrecy. Mark, England's Grand Fleet was not regarded as a certain stop for this handful of fast ships. It was the battle-cruiser squadron, because of its speed, that assured the safety of the gigantic commercial fabric; that could prevent the enemy from winning free and with superior speed and guns engage separately and destroy the Allied light cruiser squadrons that patrolled the world, generally wrecking that far-reaching system of communications and supply. The simple fact of the British battle-cruiser squadron "being" prevented this logical and, for the Allies, disastrous move on the part of Germany.

III

The airplane, embodying though it does terrific power of destruction, is inherently a defensive weapon, due to its dependence on a particularly immediate base for its fuel and ammunition. Offensive power is largely a matter of range; effective operating range, from a military standpoint, is as vitally a matter of time as of miles. To adduce it in terms only of distance is the sophistry that will argue naval strength in the glib generalities of tons and horsepower.

The fundamental weakness of air navigation is its subjection to the contingencies of weather; in contrast, one of the capital ship's chief sources of strength lies in its comparative indifference and independence. In the interesting search problem and bombing of the old battleship *Iowa* last summer, actually the most remarkable feature was the achievement of naval engineers in controlling a crewless ship from a distance of five miles; the most significant was the postponement of the problem for two days to await fair weather and good visibility for the airplanes that were to make the "search." That the ship was found and two bombs dropped on her while maneuvering at four knots establishes little: had the *Iowa* actually been an enemy approaching the coast at the time first arranged, even though the defending forces had information of

her, as far as air scouting was concerned she would have made her landfall, accomplished the bombardment or other military object and have been back at sea before the weather had cleared sufficiently for air observation even to watch her depart. Here is the real crux, the betrayal of the airman's narrow range as presently equipped. Had the navy not something more sturdy that could remain "out at night," for defense, the *Iowa* and her attack, representing an enemy battle force, would have been successful.

In the squadron and fleet engagements of the war, weather and visibility conditions were generally such as to preclude the successful operation of aircraft; the notable exception being the early hours of the battle of the Falklands between Sturdee and Von Spee. Even that battle, however, was concluded under the handicaps of low visibility, mists and rain, a condition that had prevailed unremittingly for several days, clearing only on the morning of the action.

The battle of Helgoland Bight, in August, 1914, the first naval engagement in force of the war, was fought under varying conditions of mist and low visibility, according to an authoritative account. British submarines nearly torpedoed their own cruisers going into action because of the difficulty in distinguishing them and the failure of signals. In the day's fighting most gun ranges were perforce point-blank.

At Jutland, German air reconnaissance totally broke down. Admiral Von Scheer was forced to postpone the operation that brought on the battle (the raid against Sunderland) for eight days, May 23 to 31, 1916, for, according to his own report, "it was impossible to send up airships" for the scouting he had relied upon and finally carried on without. Sixteen of his submarines were stationed from May 23 off five English North Sea ports to report movements of Grand Fleet squadrons. On the morning of the action, because of poor visibility, two of them reported the movement of a total of ten British warships—all they saw—though the number of British ships directly concerned in the action was one hundred and forty. On the same morning five Zeppelins took the air and accompanied the German High Seas Fleet into the North Sea as scouts, but Von Scheer says of them, "They took no part in the battle (of over fourteen hours), neither did they see anything of their main fleet, nor of the enemy nor hear anything of the battle.

"The *L-4*," he says further in his report, "according to her own reckoning was directly over the scene of the action at 10 p. m." This was 8 p. m. Greenwich time and in that latitude, still daylight. There thirty or more men hovered over the greatest sea battle in history, being fought over a hundred square miles at once, unaware of it.

The following day, when the North Sea from Horn's Reef to the Orkneys was literally plastered with British ships, five more Zeppelins went up for a look around.[1] Of them, two reported sighting British units, but "were unable to maintain contact." For these super-ships of the air the record is not impressive.

Admiral Beatty sent up a seaplane at the beginning of the battle-cruiser action from H. M. S. *Engadine,* that was the most successful air attempt made during the course of the battle. The pilot was forced to fly at about a thousand feet because of low visibility and cloud formations. He was thus a target for the high-angle secondary batteries of the German warships, which placed a shrapnel box around him and allowed him to approach no closer than a mile and a half. His observer made out the ship class with some difficulty and they returned after a breakdown, to report they had flown through bursting shrapnel. The necessity for the German anti-aircraft batteries never even arose. Had this plane carried bombs little could have been accomplished with them at a mile and a half.

The battle of Coronel was fought in a heavy sea and under weather and visibility conditions prohibitive to successful air scouting or attack. Many of the detached engagements between single ships throughout the war were carried on under conditions where

[1] The report of the Zeppelin *L-11* says in part: "June 1st, 1.30 a. m. went up at Nordholtz . . . . visibility limited owing to ground fog and later to fog-like atmosphere high up extending over 2 or at most 4 nautical miles. Helgoland not visible through fog. At 5.10 sighted enemy . . . . visibility so poor extremely difficult to keep contact. At 5.15 enemy opened fire on airship. . . . . Flash of guns could be seen though ships were hidden by smoke . . . . shrapnel shook airship so increased range . . . . visibility became worse and enemy lost to view at 6.20 . . . . went so low as 500 meters in hope of better visibility . . . . impossible to see over one or two miles."

Another, the *L-24,* the same morning reported: "4 a. m. sighted enemy destroyers, was fired at and returned fire with bombs. Then got away . . . . 5 a. m. sighted 12 ships in Jammer Bay. Impossible to keep contact as there was bank of clouds as low as 500 meters."

it would have been impractical to even launch an airplane. The days on which these various engagements were fought were not exceptional; they were the ordinary run of sea weather. In most latitudes, through the winter months, the days are such as would be classified "bad, or perilous flying weather."

IV

The experiments carried out against the German warships were primarily an effort by the navy to determine the resistant powers of different types of modern fighting craft to the destructive effects of air bombs. Secondarily, it was a simple and profitable means of complying with the terms under which the ships were surrendered, namely, that they would be destroyed.

The navy invited the army to participate in the tests, to share with them the compilation of data that would be advantageous and instructive to both. The army accepted and soon it was noised about that the capital ship was in its obsolescence, a new weapon of destruction, cheap and effective, had arrived to supplant it; that the tests were to determine which would survive. The issue was raised—it was the airplane or the capital ship! Of course the ships were sunk; they were towed to their last anchorage in fifty fathoms for that purpose. The attacks were carried out under conditions ideal to the airman, they were directed to fly as low as consistent with their safety, the object being to get hits and waste little ammunition as possible. They were at least once postponed to await more favorable flying conditions.

So, in an issue that was really not an issue, but a controversy manufactured by those whose interests were certainly not the navy's, the navy in many quarters has suffered an unwarranted loss of prestige, experienced a pernicious reaction from its efforts to provide against a new form of warfare. One disquieting fact, because in a measure overlooked by both "sides" in the tests, was brought out; that the water, heretofore relied upon by the armored ship as protection below which to secure its most vital organs, was in the new form of attack a critical weakness, that the air-bomb acting as a depth-charge or mine can deliver mortal wounds through this incompressible medium, and that in reality "the hits that miss are the hits that count!"

Little, however, was proven that was not already known; were someone to suddenly stop you and whisper confidentially that a mine will sink a ship, you would hardly be incredulous. You might retort that the news was several generations old.

On the other hand, much was learned and new applications of old principles were noted. Important among these was the demonstration of the thorough effectiveness of the protective deck against air attack and the virtual immunity, as regards machinery spaces and magazines of a ship so fitted against bombs. The cruiser *Frankfurt* was attacked for nine hours with bombs up to 600 pounds, during which she suffered a number of direct hits. The last inspection party to board her before she sank reported her machinery spaces apparently undamaged. This vessel was extremely light in construction for the high speed requirements, and her protective deck was two inches thick. She was fitted in addition with a narrow strip of light side armor.

Armor-piercing bombs, dropped on the battleship *Ostfriesland,* tore through two upper decks, but in every case splintered on the protective without damage to the vital spaces below it.[2]

Perhaps the greatest lesson of the tests lay in the fact that it was not the actual hits made by the airmen on the target ships that wrought the real damage. They were spectacular enough and their manifestation of force terrific. They tore apart rigging, bridges and fittings, threw wreckage incredible distances, and in general seemed to justify the airmen's most sanguine claims of their destructive virtues. But the damage was in the main superficial. Taking account of only the direct hits, under battle conditions, the *Frankfurt* and *Ostfriesland* could have maneuvered and fought with little diminution of their value as military factors. The shattering effect did not extend beyond the immediate area of the explosion, nor did it penetrate into gun turrets or conning-tower.[3] The bombs that were physically a miss determined the result in both cases, and established the dropping of explosive, not on the deck of the ship for an actual hit, but close alongside as the proper and effective attack. These seek great depth and with almost instant detonation drive the incompressible water against the light

[2] Three inches on slopes.

[3] Only the *Ostfriesland* was equipped with turrets. The 5.9-inch guns of the *Frankfurt* were mounted in the open and fitted with shields.

plating of the ship's bottom, that it had heretofore shielded from gunfire, driving it in like a paper bag. Achilles had his heel; a warship's most vulnerable area, accessible to these bombs, is that below her water and armor line.[4]

This weakness, up to the present, is a wholly justifiable one. To-day's capital ship is but an evolution of the old line-of-battleship and has been designed until now principally for defense against its kind. Perfection of subsurface resistance has lacked the inspiration of necessity, the insistence of which has only recently been felt; indeed, in vessels some time afloat a start in this direction is indicated in the "inside hull" design that has shown so favorably under test.

In the case of the battleship *Ostfriesland* it will be noted that her sinking was directly the result of capsizing; that is, she turned over on her beam ends before she sank. An inquiry into the cause of this has its inception in the preceding paragraph. Well into the last century[5] the navies of the world had concerned themselves with the question of improved underwater defense and German designers, of late well in the van on warship construction, had placed in the *Ostfriesland* and even earlier ships an intricate underwater subdivision, combining fore and aft bulkheads in addition to the thwartship ones; forerunners of the present "inside hull" and "blister" construction. German practice, as Admiral Jellicoe complains,[6] was consistently superior to other navies in their clear estimate of the value of heavier interior protection; employing, as they did, stronger integral construction and in many cases armored partitions between compartments throughout the ship, both above and below the water-line; the sole object aimed at being maximum resistance to shell-fire.[7]

[4] The prior sinking of German submarines and two destroyers had little bearing on the question of bomb effectiveness against the warship. It more closely approached sinking a tin can in a pond with rocks—to get it out of the way and at the same time to try your aim.

[5] The earliest attempt to armor a modern warship against underwater explosion occurred in the French coast battleship, *Henri IV* (1899) 8800 tons. This vessel carried a steel splinter deck, fitted below the protective deck, clear around to the turn of the bilge, where it joined onto the double bottom. The space between the decks was fitted as a cellular layer.

[6] "The Grand Fleet."

[7] Their battleships, for a given displacement, had greater percentage (by weight) of armor allowance than their British contemporaries, which more

When the *Ostfriesland,* last July, was towed to her target position off the Chesapeake Capes and anchored, she carried a degree or two list to port. Subsequent to an afternoon's bombing, in which she sustained a dozen direct hits and a number of "depth-charges," she was allowed to remain over night without attention, and in the morning when the airmen returned to the attack she was found to have settled a little by the stern with the list slightly accentuated. In the second phase thousand-pound missiles were dropped on and around her, driving holes in her bottom and opening seams with the successive shocks. Still the old warrior gave no signs of vital distress until near noon, when the airman's *pièce de résistance,* the two thousand-pound demolition bomb, was introduced.

The damage of the first day and the morning of the second seemed to observers to have been principally to port. Twenty minutes after the first two thousand-pound bomb found its mark the *Ostfriesland* turned over on her beam ends and a minute later sank.

In the rapidity of its climax, the sinking, though foreordained, was a staggering shock to all who witnessed it. In an analysis of the cause it appears that the very measures for safety taken in the vessel's design were primarily responsible for her quick succumbing to the last attack.

Due to her longitudinal subdivision, with its inherent structural power, the damage sustained the first day, concentrated largely on the port quarter, while not in itself necessarily vital, certainly became so through inattention during the night and the consequent heavy accumulation of water to the port side of the ship. The heavy armored bulkheads held as they were designed to and confined the large mass of free liquid far to one side of the vessel's

---

than compensated for their lighter guns, in minimizing the effect of interior explosions and increasing their resistance against shell-fire. As a result, they were enabled to bring heavily damaged ships successfully out of the engagement at Jutland, where British ships, no worse hit, were lost. The battle cruiser *Derfflinger* was hit in that action by twenty-eight shells of all calibers up to 15-inch, and the *Seydlitz* suffered twenty-five hits besides torpedo damage below the water-line. Both vessels were in action until the end and were repaired within a short time by German dockyards.

center-line, promoting her list and bringing more openings and superficial damage below water.[8]

Fifteen hours later, in the attack the following morning with the heaviest bombs, her declining resistant powers were unequal to the assault. Further underwater damage accomplished on both sides of the ship had quickly apparent effect. The rapidly increasing inrush of water, still preponderantly to port, her decreased righting-arm and the still virtually water-borne starboard side generated a turning moment that her great mass could not overcome; she simply turned over.[9] As she did so she bared her wounds, displaying punctures of her underwater body as if to show those who saw why she gave up the unequal fight. Many among those who saw her go down, are yet to be convinced that she was sunk by bomb-fire.

No ship was ever designed to float long on her beam-ends.

Had the *Ostfriesland* a crew aboard under actual steaming conditions, the damage suffered in the first day's attack was such as not to have even taken her out of action; and, beginning with the

[8] The capsizing of H. M. S. *Victoria* in the Mediterranean was ascribed principally to the longitudinal bulkheading system employed in her design. The *Victoria* was rammed by H. M. S. *Camperdown* on a calm sea, during fleet maneuvers in June, 1893. She was badly holed on the starboard side, above and below the water-line, taking in nine minutes a heel to starboard of 19 degrees. From there it was accelerated to a sudden lurch, submerging hatches and gunports of her main battery. Shortly afterward she turned turtle and sank.

The admission of water to two forward compartments and its confinement to the starboard side and the flooding of a forward coal bunker on the same side were given as the cause of the sudden capsizing, which resulted in great loss of life. The vessel had apparently ample reserve bouyancy, though her stability was destroyed by the uneven distribution of the water she took in. The *Victoria* was a battleship, 11,940 tons, built in 1887.

[9] Discussing the loss of eight old British battleships during the war—2 *Formidables*, 2 *Duncans*, a *King Edward*, a *Majestic* and two of the *Canopus* class—William Hovgaard, one of the foremost authorities on warship construction concludes: "Most, if not all of the vessels that were lost capsized, or at least took a heavy list before going down, whereby the foundering was much precipitated and the loss of life increased. Perhaps, in some cases, the ships might have been saved had they remained upright. The heel was due to the presence of longitudinal bulkheads, which here, as on so many other occasions, proved a most vicious feature unless associated with efficient appliances for quickly righting the ship."—*Modern History of Warships*, page 86.

handicap of the following morning, it is entirely possible with a crew to manipulate her compartments to give her proper trim and with pumps on the leaks, she could have been brought successfully out of action and saved, as she was at Jutland, after running on a mine. During that engagement the battle-cruiser *Lutzow* was fought and navigated after she had taken in over 7000 tons of water as a result of Beatty's hammering, before she was abandoned and torpedoed by her own crew. It is contended that the *Ostfriesland* had taken in enough water to capsize her, in her untrimmed condition, but insufficient (before turning turtle) to cause her to sink.

The light cruiser *Frankfurt* (which an observer-correspondent of a New York daily likened to a "powerful battle-cruiser") was still afloat after nine hours of bombing during which there was some very good shooting. At its conclusion, the airmen's ammunition had all been expended; a mining party had been called away from the battleship *North Dakota* to finish the job and get the *Frankfurt* out of the way before dark, as per schedule. It was not until then she was observed to be sinking; the actual result of a bomb dropped in the latter part of the attack that had missed the target by fifteen yards. It was well (or poorly) timed and detonated late underneath the vessel, breaking her back and actually administering the *coup de grace*. Weakened by her day's punishment, she finally bowed to this "hit."[18]

V

Returning to the airplane, we will for the moment concede in all points the claims of its most extravagant advocate. Assuming it is the superior of the capital ship in all essentials of offensive, it is immediately apparent that it will take on itself the functions of the battle-fleet in war. A basic principle of naval strategy, old as ships themselves, has been to consider the seacoast of the enemy

[18] In the detonation of this 550-pound bomb, abreast of the bridge, on the starboard side, water geysers were raised on both sides of the ship. Though there were frequent explosions near them her guns did not appear to have been damaged. The personnel manning them, however, would have unquestionably suffered severely. Although the *Frankfurt* is classed as a light cruiser, she is little more than a large destroyer leader and as lightly built. She served through the battle of Jutland as flagship of a scouting division and as such did not come under gunfire from the heavy ships. She was built in 1914; 5400 tons; 28 knots.

the proper frontier of operations. Hence, a naval power is faced with the necessity of transporting a large number of these efficient, inexpensive weapons against the bases and territory of the enemy, an operation requiring a fleet of large fast carriers, which it is supposed are already built and in commission.

The enemy, in its attempt to block the transfer of this dangerous offensive into its own territory or an area possibly disadvantageous to it, will direct its first effort against the transportation of the planes, therefore against the carrier.

Primarily, submarine or destroyer torpedo attack would be the logical method employed against the carrier, en route. For defense against this, the carrier would be protected by a screen of destroyers. Against this screen and for the protection of its own destroyers and submarines, the enemy dispatches the light cruiser. Light cruiser must be met with light cruiser, which in its turn would bring into action successively the armored and then the battle-cruiser and so right back to the capital ship, whose size, power and number, either in action or in being, would be the deciding factor in permitting to operate that which in the premise is the superior of the capital ship. In a word, before a plane could be transported on the sea a fleet action must be fought; or the disparity between the belligerent fleets so marked as to leave no doubt of the result. Under these conditions, the stronger power could undertake an air offensive in a theatre of its own choosing, while for the weaker a similar move, either as a counter attack or an independent offensive, would be out of the question.

Thus we go round in the great circle; enlarging as it does with each age of development; each decade a little more complicated, more intricately subdivided perhaps, but always deferring in the final analysis to the decision of the armored ship and the big gun. "War," says Mahan, quoting Napoleon, "is a business of positions." The allusion is not, in a strict sense, geographic, but implies as well the proper concentration and dispositions of offensive power. Suppose in a war of extermination the United States won a decisive victory with our hypothecated air fleet in a foreign area. How without the capital ship could we realize our advantage, organize our acquired positions, and from them prepare further attacks against the enemy?

Artillery, on land, is a weapon capable of driving in a position, rendering it untenable for the defending force. But artillery of

itself cannot occupy the position it has won, cannot enjoy the fruits of its strength. Occupation and consolidation with other points in the battle line must be effected with infantry, who can also establish a vigorous defense against counter-attack. The air force, in its offensive phase, is analogous to artillery, capable of forcing a position, but not of occupying it; useless without the co-operation of the other branches of the military machine. The plane, in its limited scope is capable of a very dangerous and not to be minimized assault; but there its offensive virtue ceases. Though it drives its enemy from a position, it cannot occupy it; its pilot cannot tarry if he would.

In the contest for vital points, final appeal for the military decision rests with the instrument capable of occupying and holding a position in face of the strongest concentration the enemy can bring against it. In armies the general battle plan must ever evolve around that strongest and most flexible of its components, the infantry; in naval strategy, the capital ship. Mahan, in his endorsement of this, said: "Seaworthiness and reasonable speed under all weather conditions are qualities necessary to every constituent of a fleet; but over and above these, the backbone and real power of any navy are the vessels which, by due proportion of defensive and offensive powers, are capable of taking and giving hard knocks. All others are subservient to these, and exist only for them."[21]

Thus, while to-day the air is acclaimed the new and only true basis of sea-power, it is, as can be seen, dependent on the capital ship for leave to operate in any capacity but as a factor in coast defense, from a protected base. And as it is subsidiary to the actual sea-power of the nation launching it, the airplane is relegated, like the submarine, the torpedo and mine, to its proper place as an indispensable auxiliary to the operation of the fleet. In gunnery observation and for coast defense command of the air has become a necessity, though in the latter connection it is not unreasonable to predict that the fleet engagement of the future will be fought no nearer a coast-line than either commander will permit himself to be driven. Sea room is as vitally an advantage in the day of the big gun as it was in the age of the sailing frigate.

In the field of naval offensive, the air, during the past war, had in a marked degree its opportunity for conclusive demonstration.

[21] "Preparedness for Naval War." *Harpers Magazine*, March, 1897.

Probably in no succeeding conflict between major powers will the naval effort be concentrated into such narrow compass as British preponderance steadily forced it from the opening months of the war. British naval bases, the Grand Fleet and the cruiser patrol areas were within easy range of the German air bases on the North Sea and in Flanders. Mine-sweeping operations were carried on continuously, deferring only to bad weather, while British monitors anchored at will off the French and Belgian coasts within big-gun range. Germany had at this time carried air bombing to a reasonable perfection; yet the fact remains that no persistent or extensive bombing operations were directed against the units in the North Sea, no Allied vessel was disabled from the air and few were ever subject even to attack.

The case, not amiss here, of the Turks getting the *Sultan Selim*,[12] aground in the Dardanelles, floated, repaired and moved to a place of safety in the face of the utmost efforts of British airmen with their bombs, constitutes another example of the difference of conditions as they exist in actual war, and fair weather experiments such as we undertook on the German warships.[13]

That the targets were stationary in both cases constructs an even closer analogy that throws into strong relief the dominating factor of actual hostilities. Cases of such similarity with so opposite results are not without their lesson. There is conveyed the admonition not to place a too-heavy responsibility on the new instrument now so in the ascendant;[14] not to ignore them certainly, but we

[12] Ex-German battle cruiser *Goeben*, 23,000 tons, transferred to Turkey in September, 1914. Of 28 knots speed, she was armed with ten 11-inch, twelve 5.9-inch and 4.7 anti-aircraft mounts.

[13] "During her sortie and attack on British monitors at Imbros (the *Sultan Selim*) in January, 1918, she struck at least one mine, whereupon she settled by the stern and took a list of some 10 or 15 degrees. While proceeding slowly up the Dardanelles she was vigorously attacked by aircraft and was hit several times. Finally she ran ashore at Nagara Point, and was during a whole week subjected to the most persistent and energetic attacks by British naval aviators, who made no less than 276 flights over her and scored a number of hits. Nevertheless she was refloated, went to Constantinople under her own steam and was repaired." Hovgaard, *Modern History of Warships*, page 241.

[14] In discussing the concluding operations of the German cruiser *Konigsburg*, when she was finally blockaded in the Rufiji River, East Africa, by Captain Drury Lowe in H. M. S. *Chatham*, Sir Julian S. Corbett, in his official history of the war's naval operations, says: "Having by this skil-

are warned to be slow in withdrawing the known safety of tried and proved weapons until the new have proved themselves against something more concrete, more substantial than a hulk floating on the surface of the sea. The time to perfect a weapon is unquestionably in peace; the last determination of its value is in war.

The operation of sea-power and the success of naval armaments is subject to certain principles, and though the evolution of weapons and motive power may have changed the aspect of tactics and the application of these principles to the time, they have remained basically unchanged since Salamis, since Rome forced Hannibal to a disastrous action in northern Italy because her navy dominated the western basin of the Mediterranean.

Their recognition, unconsciously adopted perhaps, but persistently and closely applied, won for England the preponderance of seapower she has exercised for four centuries; enabled her to maintain almost wholly by maritime tendons her great, loosely-knit empire. That the defeat of fleets and consequent decline of naval powers is directly due to a misapplication of these principles, the ignoring of one or more fundamentals, history readily shows. And to those who will see, the close parallel of these oversights and the inevitable penalty exacted for them, submits a consistent analysis and reads a dark prophecy for the future of our political influence as backed by naval strength necessary to the stand, in international questions, of an isolated nation.

In tonnage and man-caliber ours is a great navy and it is farthest from the writer's thoughts to hold brief for a greater. But it is incomplete, and in the light of the present faces a serious crippling from well-meaning but uninformed legislation that threatens, as it were, to kill it with kindness.

---

ful operation (sinking a block ship across the river channel) imprisoned the *Konigsburg*, at least for the time, the next step was to endeavor to destroy her. But this was no easy matter. She lay so high up amongst the tall jungle that fringed the river that the cruiser's guns (the *Chatham's*) could not reach her, and gunboats could not see her. She could only be got at with the aid of troops or by bombing. But no troops were available and the seaplane that had been sent was unequal to bombing attack."—*Official History of the War*, Naval Operations, page 389.

Though the *Konigsburg* was located October 30, 1914, it was not until July the following year that she was destroyed by gunfire from the British monitors *Severn* and *Mersey*. The seaplane referred to in the text had, operating from H. M. S. *Kinfauns Castle*, previously carried out a successful reconnaissance and located the *Konigsburg* at her jungle anchorage.

When men have devoted a lifetime of study and effort to the invention and application of the involved instruments of war only to find their judgments at fault in the severe laboratory of actual hostilities, discover that devices on which they placed high hopes fail utterly; that other devices relegated to a minor importance suddenly occupy the center of the stage and by their achievements necessitate some great defensive expansion in a wholly unlooked for quarter, it is hardly reasonable to expect others, who have devoted energies to more peaceful pursuits, business, industry, politics or administration, shall possess an infallible foresight, the absolute sense of values along these very technical channels.

That is precisely the idea this nation entertains; it is what is expected from the members of its governing body. It is so written into the laws. Through a palpable misapprehension, a misdirected effort toward economy, they invest the bodies who appropriate moneys for national defense with the authority, aye the responsibility, for directing how it shall be spent.

The laws governing appropriations for work in the military and naval services provide that such work shall be specifically outlined in the bill authorizing the appropriation, and that the money shall be used or diverted to no other purpose. If not all expended in the completion of the work authorized it shall be returned to the national treasury at the close of the fiscal year. This short-sighted policy, designed in the interest of economy (like the "cost plus 10 per cent" contracts with which we had such costly experience in the last war) lends itself readily to the practice of extravagance, is a knife that cuts two ways. It kills initiative, deprives the executive in charge of the expenditure of such money from using his judgment and skill in seeking and employing short cuts to get out the work in the shortest time and at the minimum labor charge. Should he perceive a saving, an opportunity for economy, the logical assumption is that he will avoid it. For this reason, not being allowed to divert the money thus saved and employ it in some other phase of his work where he sees need of it, it is obviously against his own interest to have any surplus at the end of the year. Suppose he returned 30 per cent of the money administered in his charge; his requests and estimates would probably be cut for the following term by that amount on the assumption that if he did it once this cheaply he should do it all the time. This in complete disregard of the fact that the officer might be unable to effect the

economy a second time or regularly, it resulting once from some extraneous condition or local circumstance. So instead he is moved to spend everything he can get and the next year ask for more than he needs in the moral certainty that he won't get enough. Is this an excellent and efficient method to administer an organization of the size of our military establishments? How long would a shipyard or any private industry endure under such a régime? How long, after bankruptcy proceedings, would it take the stockholders to land the directors in jail? The people of the United States are the stockholders in the navy, our national insurance company. A naval officer who had made a close study of naval administrations previous to the war recently declared that in the period 1911-14 Germany could by direct methods and efficient management put three capital ships in the water for the cost of one of ours. The fault lies directly at the threshold of our federal legislation.

A valuable page might be torn from England's book in the administration of our navy. There Parliament votes the Admiralty a stated sum as the naval budget, based on their requests to cover maintenance and expansion over a given period. The money appropriated is then expended to the best effect and for the needs of the fleet as they are realized by experts who have made the navy a profession; not as the House of Commons or Lords thinks it should be parceled out.

The manner in which Congressional Committees at Washington, ostensibly seeking information as to the best way to spend the nation's money in these matters, contrive to get misinformed or informed not at all, is, to say the least, discouraging. They bring out not useful facts, but usually nothing more than dreary proof of their utter lack of comprehension of the matter in hand, that which they are supposed and which it is their duty to be most closely in touch with. Quoting an article by a naval officer and introduced by Mr. King in his above referred to speech when touching on the submarine situation, it was declared that "At the hearing before the naval committees of the House and Senate during the consideration of the current (1921-22) Appropriations Bill by Congress, previous to March 4, it is astonishing to note that not a single naval officer who had actual experience in submarine warfare was called upon to testify. The so-called 'director' of submarines, who is thoroughly informed on the subject, though he has no real authority to direct submarine policy, was not permitted or invited to

appear and present the facts concerning deficiencies and crying needs." This might be excused in some quarters on the ground that the testimony suppressed might be needlessly disturbing.

In spite of great battleship power and apparent weight, our navy, in its unbalanced state, is incompetent.[15] It lacks features necessary to the whole, the proper functioning and use of which only will give to the whole its fullest scope. Representing as it does an investment of billions, its administration should be such as to render it at all times capable of exerting its full force. It should not be hampered by deprivations of material nor forced to submit to the technical conclusions and deductions of statesmen for that mechanical perfection which must be its only excuse for existence—its instant availability. Better have no navy at all than one in which we repose a false security, that may fail us when we have moved on the checkerboard of the world with the consciousness of its full support.

The dependence of effective sea-power on its undeviating basic principles cannot be too often reiterated. It is in indifference to these principles, largely through ignorance of them, regardless of pleas and criticisms of men who sail the ships, by the bodies who now administer the navy that the peril of our one day paying a heavy reckoning lies.[16] And who knows, in the present world

[15] "Under modern conditions of warfare battleships are not self-contained tactical units. More than ever they require for their assistance and protection a variety of attendant ships of different types, the most important of which are battle-cruisers, light cruisers, destroyers, submarines and aircraft. Each of these classes, besides being indispensable as tactical adjuncts to the battleships, also supplement them strategically and are required for a variety of independent duties.

"Depending on the nature of the operations, a fleet of modern battleships needs also the more extraneous assistance of mine-sweepers, mine-layers, and a host of auxiliary vessels."—Hovgaard, *Modern History of Warships*, page 480.

[16] "Naval policy is pursued in peace conditions under inevitable disadvantage in a democratic country, because there are many claims on the exchequer. Reviewing our pre-war programs of ship construction and equipment, and bearing in mind the unconsciousness of the nation generally as to the imminence of war, it is a matter for satisfaction that the boards of admiralty from the beginning of the century were able to achieve so much . . . . securing for us inestimable advantages as, I hope, I have demonstrated in my record . . . ." Sir John Jellicoe, "The Grand Fleet." Discussing German superiority in material, he says: "We did in fact obtain a margin of safety (numerical) in the most essential type of

unrest, but the exacting of that payment awaits us just around the corner?

The plea for the "three-plane navy," air, surface and subsurface, of which much has been heard, is sound and reasonable. But one plane must not be intensively developed at the expense of the others, for none of them can be effective alone! We cannot overlook the still crying necessities of the surface. We have invested too much to stop now and by reckless frugality eliminate the necessary auxiliaries that will render impotent the costly foundation with which we are possessed.

The most thorough economy is adequate safety and protection. It does not require a strategist to determine that our first line of "non-aggressive" defense is not the seacoast, but beyond.

The broadest distinction that can be drawn in a discussion of military and naval preparedness is the amount of time and labor involved in the building of a warship, and the slow, necessarily careful training of the personnel required to animate and fight the ponderous, intricate mechanism that is a city and a fort within itself. That it is a cold impossibility to put a fleet on the fighting line within years of the time that an army can be organized and thrown into the field was demonstrated past argument in the war.

The United States trained, equipped and transported to the fighting areas two and a half million soldiers, beside the additional reserve being continually augmented at home. In the navy, though, the requirements necessitated a large force of destroyers, with which we were not particularly well supplied. The rush contracts, when it was seen what was needed, provided for about 250 of the new "flush-deck" destroyers (in addition to those of the same design being completed under the 1916 program). Despite the fact that in all yards capable of building this not large or particularly complicated type, with work suspended on capital ships and production concentrated on the destroyer, only seven were completed in time to engage in actual war operations. The rest were finished, drifting into navy yards for commissioning, as late as May of this year. The essence of strategy, as one writer puts it, lies not in finding a defense after an attack has been launched, but rather in anticipating each successive development of offensive with a means to combat it at its source.

---

vessel, the capital ship, and we did gain advantage from the heavier caliber of our guns."

VI

Due to our political and geographical situation, the work the navy will be called upon to perform in the event of war against a single power, is generally determined. Our strategy, and also particularly the tactics to meet a given situation, are subject to broad rules of circumstance and can be predicted within general limits.

The fleet's want of essential constituents that will necessarily be contributory to its operation, its success or failure as a fighting force, are matters of common knowledge. The utter absence of the battle-cruiser type and the insufficient force of fast cruisers and scouts [17] is the cardinal weakness and it is of such importance as to determine the naval tactics of an enemy operating against us, basing their plans on that weakness. In the important point of control of the air we are not so irreparably behind other powers as to preclude recovery, to make it comparatively so vital a defect. Moreover, the condition and equipment of the aircraft industry in the States, the speed of their production compared with the prolonged period of a warship's construction, stresses further the need for completing the vessels of these types we have under construction: not, on the authority of certain gentlemen of Congress, allow them to die of inanition.

Americans as a people and those directing channels of opinion here have been usually careless students of history. They have too easily forgotten or perhaps never realized it was the protection of the prepared and efficient British Navy that enabled us to retrieve the military omissions and mistakes of the years preceding our entrance into the war. It was in the security of their silent Grand Fleet, hidden in the mists of the Orkneys, that our blunders were overcome with feverish haste and appalling cost; others made and retrieved, till at last we were able to throw our full weight into the conflict, probably as the decisive factor. In possibly no other combination of politics and treaty can we ever again employ the friendly protection of such an organization of steel and manhood; to repair behind its impregnable front the mistakes of peaceful years. We are warned, therefore, to consult our safety and the proper means to assure it. The next war will find us alone with our antagonist, with the world looking on.

[17] We now have ten of these vessels (7100 tons, 35 knots, 8.6-inch guns) only two of which are well advanced. The completion dates on the others are "indefinite." We should have twenty-five or thirty.

The period of colonial expansion succeeding the Spanish war, our penetration of the Pacific, the Far East and the Caribbean carried with it increased responsibilities and incurred for us a new and imperative interest in world affairs; there devolved upon the navy graver and more complicated duties. The nature of them was immediately reflected in the design of the first-line ships, which from coast defense vessels previously fulfilling every requirement of our strategy, there were developed sea-going types of greater size and increased radii of operation. With the enlarged demands met in the design, there also arose the necessity of types of ships we had hitherto not possessed in any force, and for which we had had no particular use. These were particularly the fast cruiser types, and—since the *Columbia* and *Minneapolis*, of 1892, which were in a measure ahead of their time—in twenty years only feeble and occasional effort has been made to meet this need.[28] The importance of these vessels and the manifold duties with which their capabilities endowed them were thoroughly determined in the war.

While in the foregoing the battle-cruiser has been dealt with largely in a comparative sense, its fundamental relation to proper fleet operation is self-evident. The complete recital of their functions is not within the scope of this discussion and the reader is referred to authoritative works that fully treat with this important arm. The fact that we have none, that the start made on the six authorized seems in a fair way to be atrophied by efforts to turn them into something they are not, or suspend construction, with heavy loss and the more than even chance of their total abandonment, cannot be viewed but with the keenest apprehension. They may be termed the keystone of the efficient navy. Without battle-cruisers, in a campaign in the Pacific our fleet could be brought to virtual impotence without having seen the enemy battle-fleet or brought them to action. They dare not leave our coast for inability to protect their communications and supplies, the lines of which would be instantly imperilled by the enemy's battle-cruiser force.

This is a fair appraisal of a situation urged and brought about in the name of economy and based evidently on an exiguous hope of lasting peace.

[28] The *Chester, Birmingham* and *Salem* (1908), 24.5 knots, 3800 tons, two 5-inch and six 3-inch guns. These vessels were virtually experimental boats and nothing was done from the lessons drawn from them.

War at the present time, economists assert, is a physical impossibility. Money enters their discussions as the prime prohibitive factor. Several facts face us. Japan emerged from the World War with greater profit for her investment than any belligerent; the only participant, in fact, who is the clear gainer. There has been little effort to disguise her ambitions in the Pacific, and she is there the only power pursuing an aggressive policy. In 1890 Japan was declared to be too small, too weak, too poor to fight China. She won the Chinese war in 1895, and under like unfavorable predictions defeated Russia in 1904-5. She has developed as a result an intense national spirit and confidence that bids to carry her far. The fruits in territory and authority accorded her at Versailles could not but confirm and enlarge this self-estimate and seem to sanction the propriety of her aims. Acquisition of the German archipelagoes, in addition to broad mandatory powers, established a foothold and interest in the Pacific that she immediately came to regard as indispensable to her existence as an empire, any question of which she is prepared to protest vigorously. Her dreams of expansion are just beginning to be realized and the nation, as a man, is bending every effort to the accomplishment of its splendid vision. Japan is at this time spending a greater proportion of her revenue on naval maintenance and additional construction than any nation has before in history. On paper the third most powerful, but actually the second, she defers only to England in naval strength. She is forced to go on with her stupendous program, according to her statesmen, because of threats, potential or otherwise, against her integrity in the Far East. She is now said to be in extreme straits financially as a result of this heavy armament program, and she will sit at the disarmament conference in short mood to listen to discussions of authority in the Far East, which she has come to believe are for her sole disposal. Economists aver that she cannot undertake a war because of her lack of financial resource.

It is interesting to recall that primarily lack of money and the prospect of industrial stagnation and bankruptcy, rather than a glittering illusion, inspired in the Germans their dream of world conquest and moved them to their threat at civilization. It was for Germany a simple sum in economics; the available markets for her merchandise had been cultivated to their utmost limit; she was at the end of her resources in the great armament race whose pace

she had set; the density of her population and the immediate need for expansion, the creation of new markets for the surplus production of her highly organized industries and the feeding of the overpopulated homeland, made imperative the acquisition of new territories that could only be had at the expense of other nations. She had the tools of war, and certainly from her point of view was so situated as to justify their opportunity. Billions of foreign capital were invested in the industries of the fatherland, its mills, mines and railways. The real property and the raw materials—the only things the possession of which constituted absolute ownership—were in her hands. She was bound to her creditors simply by a promise to pay. What was a simpler solution than to abrogate her debts through war and by conquest acquire territory, expand into new markets, and with new lands to develop and exploit, relieve by emigration the overcrowded home states, plant the flag of the fatherland in all quarters of the globe and gain not in one direction, but several?

This is a situation one phase or another of which may be experienced by any nation geographically restricted, in the course of rapid expansion, in its transition from obscurity to greatness. The point of view of its statesmen in their scrutiny of the case will be, as it were, from the under side; from that angle, where there being little to lose, all arguments towards a trial by force are favorable. A small nation seldom engages a larger in war except under conditions where the advantages to be gained far outweigh the costs even of a probable defeat.

From Japan's viewpoint, a nation contesting with her the supremacy of the Pacific will conduct a war under circumstances overwhelmingly in Japan's favor; a war, where what she risks in defeat is so inconsiderable beside the infinite possibilities attending a victory that it would be a chance well worth taking, an opportunity where her own magnificent equipment, for what would be primarily a naval war close to her own bases, could be utilized to the fullest advantage.

It is not in the key of an alarmist that these conditions are adduced. They are facts of very general information, briefly reviewed for their application to our own position, for the future relation they may have to the irrational naval policy we are pursuing. This policy admits of quick correction with little fuss and, for the premium of security attained, at small expense. It urges

simply the completion, with minor modifications of something we undertook before we were involved in the World War, in which we have already heavily invested, a naval program dictated by an analysis of conditions as they affect us alone.

Even though the corrective be applied and we move again with reason and progress, with a thoroughly equipped, well-balanced naval service, this favorable condition will have but short tenure. For the cause of its present inefficient state lies deeper than an injudicious apportioning of matériel; it has its fundamental weakness in the nature of our legislation. It lies in the wielding of the all-powerful financial club by Congress to retain their supervision in the technical administration of the navy and the army. Vacillations of policy such as shown in the last year, betrays the inability of the political intellect to grasp the fundamental of defense, its versatility, its flair for the distractions of the moment. Until the military services with their governing boards shall have unhampered disposal of the funds voted them, to be used as training and experience approves, a sound policy along these lines, however well planned and initiated, can never be pursued to its conclusion through a term of years or a succession of administrations.

The experiments off the Chesapeake Capes last summer, in addition to serving as a basis for much misleading oratory, placed us perhaps on the threshold of another epoch in naval warfare, as important with relation to future development as the *Monitor* and *Merrimac* were to the evolution of the battleship.

The net result of the sinking of the ex-German warships, however, may be summarized as a sweeping victory for the depth-charge. As indicative of the destructive possibilities of the aerial bomb acting as such, it was valuable and interesting. As argument for the military superiority of the airplane over the fighting ship, it was spectacular but unconvincing. That decision will be dictated by development that will come—if ever it does come—far in the future.

When the airship is built that can maintain itself in its element with the reliability, safety and continuance with which the big-gun ship can keep the sea, then may the predominance of the surface battle-fleet be challenged from above, and on equal terms the survival of the fittest be determined. Then, and not until then, can the place of the capital ship, as the dominating factor in naval strategy be seriously called into question.

Vol. 47, No. 11 November, 1921 Whole No. 225

United States Naval Institute

Proceedings

PUBLISHED MONTHLY
EDITED BY F. M. ROBINSON

U. S. NAVAL INSTITUTE
ANNAPOLIS — MARYLAND

COPYRIGHT, 1921
By J. W. CONROY
TRUSTEE FOR U. S. NAVAL INSTITUTE

The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

The writers only are responsible for the contents of their respective articles

CONTENTS

USE OF AIRCRAFT IN NAVAL WARFARE. By Commander D. E. Cummings, U. S. Navy 1677

THE SALVAGE OF THE "LEONARDO DA VINCI." By Lieut. Colonel A. Guidoni, Italian Navy 1689

RIGID AIRSHIPS. By Lieut. Commander Garland Fulton (C. C.), U. S. Navy 1697

THE NAVAL OFFICER AND THE CIVILIAN. By Professor William O. Stevens, Department of English, U. S. Naval Academy 1725

YAP. By Commander B. C. Allen, U. S. Navy 1741

ACROSS THE CONTINENT WITH AN INSANE MAN. By Admiral R. E. Coontz, U. S. Navy 1749

THE STUDY OF HISTORY FOR NAVAL OFFICERS. By Commander C. B. Mayo, U. S. Navy 1755

$T = C - W$. By Lieut. Commander James C. Van de Carr, U. S. Navy 1763

TACTICAL AND FIRE CONCENTRATION PROBLEMS AND THEIR SOLUTIONS. By Lieut. Commander H. W. Hill, U. S. Navy 1765

A SOLUTION OF THE OFFICER PERSONNEL SITUATION. By Lieut. Commander F. G. Blasdel, U. S. Navy 1779

SECRETARY'S NOTES 1787

PROFESSIONAL NOTES 1791

NOTES ON INTERNATIONAL AFFAIRS 1847

INFORMATION INDEX 1789

OFFICERS OF THE INSTITUTE

President

REAR ADMIRAL BRADLEY A. FISKE, U. S. NAVY

Vice President

REAR ADMIRAL HENRY B. WILSON, U. S. NAVY

Secretary and Treasurer

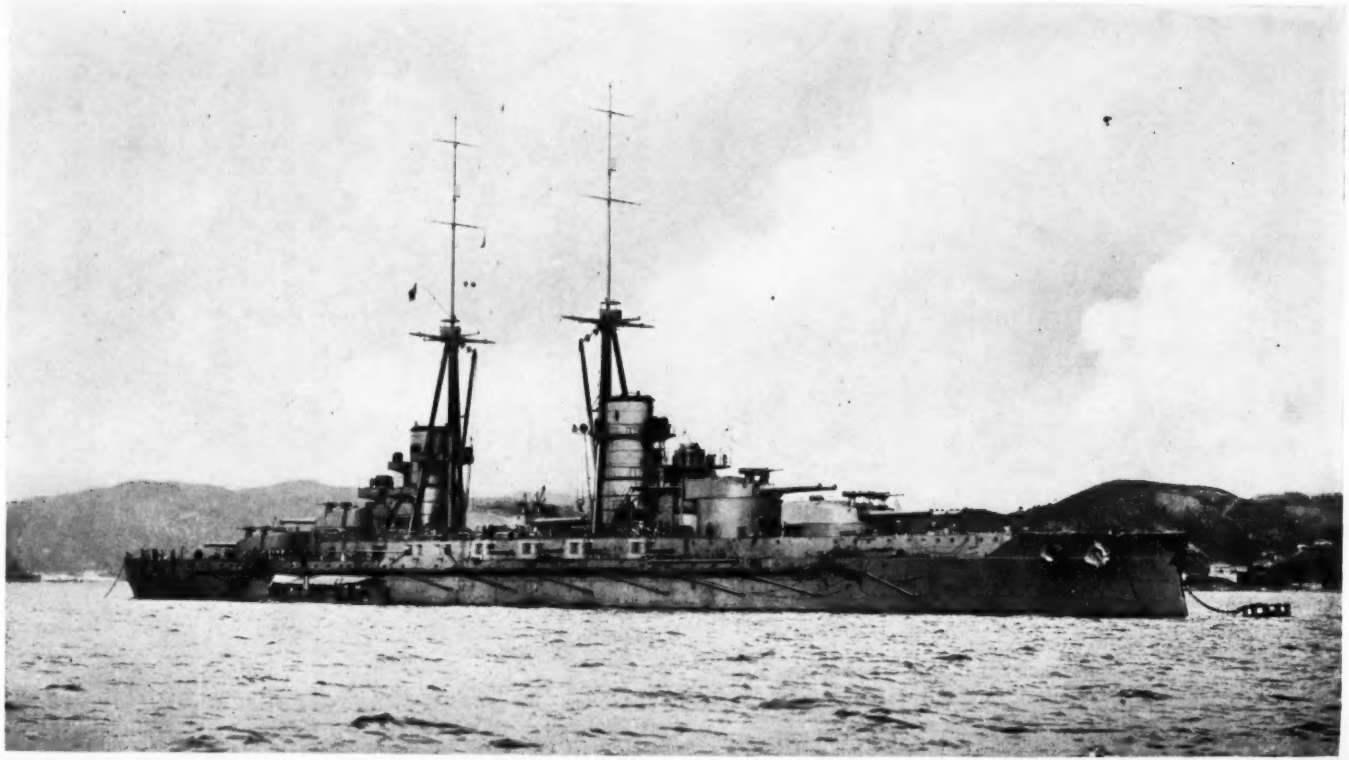
COMMANDER F. M. ROBINSON, U. S. Navy

Board of Control

REAR ADMIRAL BRADLEY A. FISKE, U. S. NAVY (*ex officio*)
REAR ADMIRAL HENRY B. WILSON, U. S. NAVY (*ex officio*)
BRIGADIER GENERAL GEORGE RICHARDS, U. S. M. C.
CAPTAIN JOHN HALLIGAN, JR., U. S. NAVY
CAPTAIN J. A. FURER (C. C.), U. S. NAVY
COMMANDER JOHN DOWNES, U. S. NAVY
COMMANDER J. O. RICHARDSON, U. S. NAVY
COMMANDER F. M. ROBINSON, U. S. NAVY (*ex officio*)

PAST PRESIDENTS

ADMIRAL DAVID D. PORTER, U. S. NAVY, 1873
REAR ADMIRAL JOHN L. WORDEN, U. S. NAVY, 1874
REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1875–JAN. 1878
COMMODORE FOXHALL A. PARKER, U. S. NAVY, JAN. 1878–JAN. 1879
REAR ADMIRAL JOHN RODGERS, U. S. NAVY, JAN. 1879–JAN. 1882
REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1882–JAN. 1883
REAR ADMIRAL THORNTON A. JENKINS, U. S. NAVY, JAN. 1883–OCT. 1885
REAR ADMIRAL EDWARD SIMPSON, U. S. NAVY, OCT. 1885–OCT. 1887
REAR ADMIRAL STEPHEN B. LUCE, U. S. NAVY, OCT. 1887–OCT. 1898
REAR ADMIRAL WM. T. SAMPSON, U. S. NAVY, OCT. 1898–OCT. 1902
REAR ADMIRAL H. C. TAYLOR, U. S. NAVY, OCT. 1902–OCT. 1904
REAR ADMIRAL C. F. GOODRICH, U. S. NAVY, OCT. 1904–OCT. 1909
REAR ADMIRAL RICHARD WAINWRIGHT, U. S. NAVY, OCT. 1909–OCT 1911



R. N. "LEONARDO DA VINCI"

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 47, No. 11 NOVEMBER, 1921 Whole No. 225

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

USE OF AIRCRAFT IN NAVAL WARFARE

By COMMANDER D. E. CUMMINGS, U. S. Navy

Aircraft appeared in the great war as a new instrument of warfare. They are still a new instrument, whose development is incomplete, and imperfectly understood. In order, therefore, that their use in warfare may be developed and that officers may be enabled to employ them intelligently it is necessary to consider (a) the performances of which they may now be considered capable, (b) the limitations to which they are subject, and (c) the direction in which they may be expected to develop.

In general, aircraft are of two types, (1) heavier than air, and (2) lighter than air. Heavier than air machines are designed to alight on land or on water; and some of each type are fitted to land, in emergency, on either element. The heavier-than-air machines in use at present are all planes.

Another type of heavier-than-air machine, known as a helicopter, or gyrocopter, is in process of development, in which the propeller rotates on a vertical axis. This will differ from the airplane in that it can take off, alight, and maneuver without maintaining a high horizontal speed component.

Lighter-than-air machines include free balloons, kite (captive) balloons, and dirigibles. The free balloon is the old circus variety which, when released, is entirely at the mercy of the wind, and which can be controlled only by tethering it and by varying the

R. N. "LEONARDO DA VINCI"

weights carried, or gas pressure in envelope. The kite balloon is a captive balloon, with devices to keep it headed into the wind. The dirigible is a free balloon with motive power and steering apparatus added.

The value of aircraft in war lies in a number of factors, such as their mobility, their vision, their speed, the difficulty of attacking them. They can observe places otherwise inaccessible for observation. They can operate over either land or sea, they can reach and depart from a point of vantage for observation and bombardment with great speed, they can get a bird's-eye view of the earth's surface within their radius of vision, which angle gives them a much truer and more complete picture than a view from near the surface. In many cases they can reach and depart from their vantage point without disclosing their presence. Their advantage of vision lies both in the angle from which they observe and in the speed with which they come and go, and, sometimes, in the distance they can see.

Range of vision varies extremely according to conditions. At Philadelphia, on a hazy day, planes rose above the haze and saw Atlantic City, 60 miles away. On a clear day, planes at Hampton Roads saw ships at sea clearly, in detail, at 30 miles, and saw the smoke of Richmond, 90 miles away; while the day before the same plane, spotting for firing ships, at a height of 1500 feet over target could see the target but could not see even the flashes of the guns of the firing ships. No rule for visibility of, or from, aircraft can therefore be of great value. Haze at different altitudes may be indistinguishable from deck and yet reduce vision of aircraft materially.

The visibility of aircraft is very variable. A 100-foot flying boat operating as part of a squadron in the clear daylight weather of Guantanamo was completely lost sight of by a similar boat at a distance inside of five miles; while the *NC-4*, approaching Lisbon, silhouetted against the western sky at sunset, was picked up at a distance of perhaps 20 miles.

Generally, planes are least visible when flying low, headed directly toward or away from the observer. They are most easily picked up on a clear day with high stratus cloud formations; and are difficult to pick up on the average clear day when there is a certain amount of haze. Usually there is no smoke to give them away, though the smoke of the *NC-4* was picked up at Lisbon

BOMBING THE EX-GERMAN "FRANKFORT."

before the plane. Protective coloration is not effective in the case of planes seen from below, as the visible part of them is always in shadow and looks black at a distance. Relative to ships, in most conditions, the small size of the plane makes its visibility less than its vision.

Lighter-than-air craft can be painted to be very inconspicuous under particular conditions, but under other conditions will be seen much further than they can see. Kite balloons frequently disclose the presence of the ships carrying them long before they themselves see anything.

The tactical qualities of aircraft are generally similar to those of ships. Every aircraft is a compromise, exactly as a ship is a compromise, between the various desirable factors, the preponderance of the one or the other being governed by the requirements of the service to which the aircraft is to be put. The tactical qualities may be said to consist of speed, radius, turning circle, acrobatics, carrying capacity, minimum flying speed, size, climb, ceiling, take off, landing, mooring requirements, seaworthiness, airworthiness, battery. Some of these depend to some extent on others. Thus acrobatics depend on speed and available power, but also on properly proportioned structural strength and on rudder effect. Take off depends on minimum flying speed and climb, and is governed (in the case of water-borne craft) by hull shape, so that the craft cannot take off until it has speed enough to remain in the air, else it would hop from wave crest to crest and smash itself up. Power, weight per horsepower, and lifting area govern the capacity of a given plane.

The carrying capacity of aircraft is strictly limited by the design. This carrying capacity may be used for equipment, fuel, crew, armor, armament. Thus a bomber can greatly increase his radius by carrying extra fuel in place of his bombs, and a large machine can carry many passengers a short distance at the expense of fuel. Many extraordinary aircraft performances are therefore of limited value as indicating the practical possibilities of aircraft, inasmuch as they are accomplished by dispensing with other things that are necessary to practical work.

Aircraft have been armed with machine guns, Davis guns up to 3-inch, automatic cannon up to 75-mm., bombs, torpedoes. Machine guns are mounted in small fighting machines either to fire between the blades of the moving propeller, being synchronized

with it; or to fire through the hollow propeller shaft, or upon movable mounts, firing clear of propeller in any direction. Large craft usually have machine guns mounted to fire clear of the propeller, in any direction. Synchronized guns must be fixed, and are aimed by aiming the aircraft. Armor has not generally been employed in the past, but is increasing. Engines, gas tanks, and pilot's seats are generally the essential points to be armored. Special means to accomplish some of the ends served by armor have been devised. Thus non-inflammable gas for balloons has been developed; gas tanks that will not leak when punctured, etc.

Aircraft are subject to certain limitations that govern the uses to which they may be put. Many of these limitations are subject to constant change as material and the knowledge of it develops. Thus the weight which may be lifted by a plane of a given power and speed is a function of the area and efficiency of the lifting surface and of the wind resistance. In a given type of machine, as the linear dimensions increase, the ratio of useful load to gross load increases less and less rapidly, so that, beyond a certain point, increase of size can only be obtained by lightening the load, by increasing the ratio power to weight of engine, by sacrificing some tactical features, or by changing the type. All these matters are being studied constantly; engines have reduced their factors of safety to a minimum, but new types of greater power per unit of weight may be developed; new types are being studied constantly. New methods of obtaining strength with less weight, and of streamlining are being developed. Very great increase in airplane size would seem to be dependent very largely on the development of an entirely new power plant, the present type having approached its maximum perfection. The resistance due to struts, wires, etc., known as "parasite" resistance, is a minimum on a monoplane.

One of the greatest limitations to which aircraft are now subject is life of the materials employed. The safe life of aircraft is limited by deterioration of wing fabric, struts, etc., which cannot always be detected from the outside. Obviously that limitation will be gradually removed as materials develop. Engines can be renewed bodily at will. The average safe life of a Liberty engine, which in its field compares favorably with any other, between overhauls is 75 operating hours. After a total of 215 hours they are not considered safe. That limitation also is subject to change, but not so much as in the case of the structural parts because,

(a) they have already been reduced to an approximately minimum factor of safety, and (b) engine failure in the air does not in itself mean certain disaster, as failure of important structural parts frequently does, because landing can be made without power if a suitable landing place is available within effective gliding distance. Probability of structural failure is negligible. At one air station, after a year's experience, forced landing averaged one in forty flights.

Aircraft are limited in their operations by the requirement that they must alight at suitable landing places. The requirements are (a) conditions which make a safe landing possible, and (b) conditions which will enable the aircraft to take off again. In order to land, a water-borne plane must have a clear water area, smooth enough for the type of machine, free from stakes or floating debris, and clear of interferences. To take off again, it must have these, and, in addition, a sufficient area in which to gather speed and climb clear of interference. More space is required to take off than to land. A land machine's requirements are similar, substituting for the water area a smooth field. In restricted areas wind direction must be favorable, especially for taking off. Lighter than air machines must alight where suitable unencumbered areas with specially designed, permanent mooring equipment are available, although it will probably prove practicable to moor out a dirigible without special equipment under favorable conditions.

Radius of action is limited by fuel carrying capacity. Possibilities exist in this line for the development of motors making more efficient use of fuel or of a more concentrated fuel or both.

Another restriction to the use of some types of aircraft is their limited habitability; but that can be met in large degree where necessary; the larger craft correspond to submarines in that respect.

The uses of aircraft in war include (a) scouting, (b) bombing, (c) torpedo firing, (d) spotting, (e) lookout, (f) combat, (g) escort, (h) attack on surface craft by gunfire, (i) despatch carrying, (j) transportation.

(g) is of particular value in submarine danger zones, since underwater craft can, in many cases, be clearly seen from aircraft, which can guide surface craft to the attack, point out safe courses for non-military vessels, or drive the submarine under

by bombing attacks or gunfire. The essence of defense against submarines is vision, which aircraft possess in the highest degree.

In the east coast of England submarine zone, large convoys passed constantly. Submarines always menaced them. Sinkings were daily occurrences. During five months of aerial patrol in this area, not a single sinking occurred in the presence of airplane patrols except one, and in that case the plane was on the surface of the water, in tow, and obviously unable to take the air.

Aircraft are particularly suited for scouting work, on account of their speed, and vision. They are handicapped, in this duty, by (a) their limited radius—they cannot expect to alight at sea and await fuel, as has been done by destroyers during the war, except under favorable conditions or as development progresses; (b) their limited radio range, which can be increased indefinitely if the circumstances justify the carrying of the extra weight; (c) defensibility—due regard must be had to the nature of the opposition that is to be met, whether it can be beaten off or avoided, or whether visibility conditions are such that the machines can see without being seen or heard—which would be their best defense; (d) reliability of motors. In machines that are operated alone over the high seas, much must be sacrificed to reliability, else the ratio of results to cost would be too low to warrant the free use of this valuable instrument.

A letter dated at Hampton Roads, 27 April, 1920, speaking of the Atlantic Fleet Air Detachment, says:

> We have just arrived here, yesterday, from Guantanamo, via Nuevitas, Turtle Harbor (near Miami) and Fernandina, Florida, and Southport, N. C.....we are anchored west of the operating base with the planes anchored just outside of the submarine basin. The people at the Air Station can't quite get it through their heads that we don't want anything from the Station, but we simply don't. These planes will be turned in to the factory. They have been in service since we got them last October, and have had about 150 hours in the air apiece..... From Guantanamo each flight has been without casualty, except that one plane landed once for a few minutes to change a distributor head." This detachment consists of six F-5-L flying boats with two Liberty engines each; and has visited Philadelphia, Hampton Roads, Pensacola, Guantanamo, Samana Bay, Virgin Islands, and other West India Islands and intervening points.

Dirigibles are especially adapted to long distance strategical scouting, where they are not liable to meet effective aerial resis-

tance, on account of their great radius and ability to remain in the air without consuming fuel, while planes must keep going at high speed to remain in the air. . . . . (e) A further and most important consideration is the question of navigation, which will be treated in some detail below. Within its radius, the conventional methods of search by surface vessels are all open to aircraft, remembering, however, that the aircraft course and speed made good is always the resultant of its own speed and course through the air and the speed and course of the wind. Thus a change of course may involve a difference in speed over the water of twice the velocity of the wind. If the wind is force 5, that means a 50-knot change of speed. "Scouting and Screening" also gives certain methods of utilizing ship planes to increase an area searched or to decrease fuel consumption in covering a given area.

The problem of bombing aircraft is purely an application of the principles of gunnery. In gunnery, the angle of discharge of the projectile is varied to suit the relative positions and speeds and courses of ship and target, while in bombing the angle of discharge is fixed and the position of the aircraft is varied to suit the speed and course conditions. The elements involved are (a) speed and course of aircraft relative to target, (b) altitude, (c) bomb trajectory. The component of the bomb trajectory resulting from the speed of aircraft is much greater, obviously, than the corresponding element in the case of a firing ship. The bomb trajectory depends upon coefficient of form and specific gravity of the bomb, and to some extent on lateral wind effect on bomb. Relative speed and course depend upon air speed and course of aircraft, direction and velocity of wind, course and speed of target. If these three, or their resultant, and the altitude can be accurately determined, the problem of bombing becomes largely one of mathematics. The tactics of bombing at sea under favorable conditions are as follows: (1) Set sight for airspeed for aircraft. (2) Set sight for altitude from altimeter. (3) By observation and estimate (quite accurate from air as regards course) set sight for target course and speed. (4) Approach up or down wind to determine direction of wind (which may be entirely different in upper air than below). Set sight for direction of wind. (5) Approach from right angles to wind to determine wind velocity. Set sight accordingly. (6) Approach on steady course, fire when on. This procedure, carefully followed through by a trained aircraft crew, in good air

conditions, will give results whose accuracy depends entirely upon the accuracy of the instruments and sight employed and upon the skill of the personnel.

Results of bombing practices under target practice conditions are of limited value as indicating actual results obtainable. In judging the figures, it should be borne in mind that:

(a) Bombs used are sub-caliber. At least 10 per cent greater accurracy may be expected from the full-size bomb.

(b) Present instruments are of limited accuracy, and calibrating, or "bore sighting," is not always adequately carried out.

(c) All firing is done with open sights, mechanically very imperfect. Greatly improved telescope sights are in experimental use now.

(d) Figures are misleading, in that the target area is a circle, while the pattern is usually an ellipse.

The recent exercises against ex-German ships are of more value, and indicate great hitting ability under favorable conditions.

The effectiveness of a bomb depends upon various factors. One is the penetration of the bomb before explosion. Another is the parts of the ship on which the explosion exerts its force. An aircraft carrier would make a very fine target, in this respect, as well as in size. Another is the speed of the projectile, and herein lies a difficulty, for the speed of a bomb is due entirely to gravity. While in a vacuum the speed would increase rapidly with the height from which dropped, actually a point is soon reached where air resistance balances the force of gravity and the downward speed becomes constant. This speed has been increased by streamlining the projectile. Recent experiments at Indian Head show better penetration results than had been anticipated. It is to be remembered that properly fused bombs will give depth charge effects even if an actual hit is not scored.

It has been authoritatively stated that: "Experimental development of the torpedo launching from aircraft is promising and there is no reason to doubt that ships may be successfully attacked in this manner. The tactics of this attack remain to be developed, but from a mechanical point of view no difficulty need apparently be anticipated." The method of launching torpedoes from airplanes consists in flying within a few feet of the water, heading toward the target, and releasing the torpedo, after which the

torpedo behaves precisely as does any other torpedo. The attack may be masked by a barrage of smoke bombs under conditions which will make the latter effective. In getting very near the water within torpedo range, the plane subjects itself to the possibility of zone shrapnel or fuzed H. E. fire from the entire battery of surface vessels, laying guns on the horizon and training on the plane. A very effective barrage might thus be laid. Even more effective would be a "splash" barrage ahead of the plane. This method was proposed for use in the British fleet. Wings, rudders, stabilizers, etc., are of fabric and would be wrecked by a splash; and the substitution of metal surfaces, as has been done in some planes, would probably not enable a plane to pass through a splash barrage. Aside from all the questions of directing the torpedo itself so that it may make a hit, it is difficult to launch one effectively. Too great height or speed will result in deranging a torpedo. Thus, when a service torpedo was recently dropped from a Martin Bomber at 35 feet, and at high speed, the head broke off and spun in the air when the torpedo hit the water.

Comparing torpedoes with bombs as aircraft weapons, it may be considered that: (1) A large proportion of the torpedo weight is taken up by machinery which has no destructive effect; (2) structural defense against torpedoes is highly developed; (3) zone fire and water barrage against craft within a few feet of the water and on a course giving small deflection promises many more hits than any high angle defense now in sight; (4) torpedo directors are better developed than bomb sights.

The usefulness of aircraft for spotting has been recognized by both the British and the United States navies. From the experience to date it may be stated that:

(a) Aircraft, from their position, can observe the fall of shot immensely better, than anyone on board ship.

(b) Aircraft can sometimes spot successfully when ship's spotters are prevented by (1) smoke screens, (2) thick weather, (3) target hull-down beyond horizon.

(c) Planes have thus far proved to be better spotting platforms than kite balloons.

(d) Planes can seek best position for observation, while kite balloons can vary position only in height. This is most important in practice.

(e) Planes, when up, do not hamper handling of ship. Kite balloons do.

(f) Communications are an absolute essential.

(g) Selective radio communication is to some extent possible to prevent interference of various spotting planes. Four planes have thus communicated without interference.

(h) Spotting is best done by planes carrying two or more persons.

(i) It is difficult, but by no means impracticable, to differentiate reasonably well between the salvos from various ships and between the targets that various ships are firing at.

Since kite balloons are much more vulnerable to attack from enemy aircraft than are planes, it may be considered that planes are the more desirable for spotting. When spotting, planes take position according to the visibility of the targets and to the effectiveness of the enemy's anti-aircraft measures. Their special value for the service lies in the fact that they can take position so as to accommodate themselves to existing conditions.

For simple lookout, as distinguished from scouting, an advantage of position over ship board observer is gained by the use of kite balloons. This advantage of position enables an observer, under favorable conditions, to see a submarine better than from deck. For surface craft, and for submarines not in favorable position, the advantage of vision is frequently offset by the added visibility. For observation of channels and along shore work they are useful. They are very vulnerable to attack from mobile aircraft due to their immobility and consequent helplessness.

Combat machines are usually small land planes of great speed, climb, and aerobatic ability, armed with machine guns for use against other aircraft. The maneuvers executed by such craft vary with the whim of the pilot; but consist generally in maneuvering to get the opponent under a quick momentary burst of machine gunfire without getting in his arc of fire. Defense against such craft by aircraft may be by out-maneuvering them along the same line, or, in the case of large planes, by machine gunfire from a large number of machine guns capable of firing in any direction. To render this defense adequate the problem must be met of eliminating "blind spots" and in large machines placing guns to fire in absolutely all directions. Lighter-than-air craft are not defensible against combat planes, nor, generally,

against planes of greater speed, climb, and ceiling, except that gun platforms have been rigged on top of Zeppelins, and it is probable that in future types guns will be so placed on rigid dirigibles as to be able to fire in all directions. The gunnery problem of combat planes involves such great speeds, variety of angles of approach, and quick turns, that long ranges are not attempted, and sight setting is practically non-existent, sights being designed with one fixed point and one movable, the movable one being controlled by the effective wind. Devices are usually added to assist the gunner in estimating the allowance for course and speed of the target relative to own plane. Training for this work is by means of camera guns, which photograph the target and show whether or not hits would have been scored.

Recent developments in airplane cannon seem to indicate that the use of cannon of 1-pounder, 3-pounder, and 3-inch is perfectly practicable. No exact data is available as to the use of these guns except that it is known that a high percentage of hits can be obtained on surface targets from altitudes up to 1000 or 2000 feet. These are not Davis guns, but automatic or semi-automatic guns of conventional type. Such guns suggest the feasibility of attacking light craft such as submarines and destroyers. The use of these guns or of machine guns to drive personnel from decks or from fire control tops is also suggested as an occasionally and probably practicable method of attack.

The question of anti-aircraft defense ashore and afloat differs materially for much the same reasons that gunnery differs. An essential part of any defense is a lookout sufficient to give ample warning of the presence of attacking aircraft. It would probably be impossible entirely to prevent observation of a naval base by enemy aircraft except by denying them a starting point within their radius. Operations to that end may be conducted by the use of longer radius observation aircraft with bombs or supported by surface craft. The use of artillery and splash barrage against planes would be effective in the case of planes flying very close to the water as to discharge torpedoes. Against lighter-than-air craft, in daylight, it is less difficult within gunnery angle ranges. The use of artillery against aircraft by ships is difficult and of limited effectiveness. Machine guns with a proportion of tracer bullets are effective within an altitude of 4000 feet when skillfully

operated. Defense of fixed positions against dirigibles and low altitude planes at night is most effective by means of curtains of streamers hung from lines supported by captive balloons. Such lines have been strung at altitudes up to 10,000 feet. The most effective defense for fleet and most other purposes is combat planes of our own, out-numbering and out-speeding the enemy's planes.

The navigation of aircraft presents the same problem as the navigation of ships, but with some features very greatly emphasized. Thus air currents are of unknown direction, and very speedy, so that dead reckoning frequently is entirely untrustworthy. Air currents vary in velocity and direction at various altitudes and at various places. An air indicating balloon released for observation purposes at Lisbon moved in a spiral covering 16 points of the compass before reaching 5000 feet. With a wind of 20 knots, that means that two planes steering the same compass courses at the same air speeds from the same place, but at different altitude would be 40 miles apart at the end of an hour. When landmarks are in sight, or ships, the course made good may sometimes be determined. It is sometimes possible to drop smoke bombs on the water and take observations of them. The taking of observations of the sun and stars is difficult due to inaccuracy of height of eye estimations. This has been overcome to some extent by development of a leveling sextant, which uses a self-contained bubble for horizon. The amount of apparatus that can be carried and used is limited by weight and space considerations. Observations are difficult due to the physical inconvenience of exposure to a wind of 60 knots or more while observing.

A very great aid to navigation may at times be found, when light conditions are favorable, by the character of the bottom or the depth. Thus, in southern waters, where ships are frequently piloted by eye from the top, aircraft can frequently identify characteristic formations. Isolated reefs or deep spots, or sharply defined depth curves can frequently be identified and furnish excellent land or water marks.

Aircraft can also obtain fixes from radio compass stations. In so doing, owing to speed of aircraft, observations by various stations should be taken on signal at the same instant. Results within 3° have been obtained, and this can be bettered.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SALVAGE OF THE *LEONARDO DA VINCI*

By Lieut. Colonel A. Guidoni, Italian Navy

The night of August 2, 1916, the Italian dreadnought *Leonardo da Vinci* was moored in the Mar Piccolo of Taranto in a depth of about 6 fathoms when, following an explosion in the aft magazine, she was sunk, almost completely overturning with her turrets fast in the muddy bottom. Only a small part of the forward portion of the vessel was left above water. The explosion had opened two large leaks in the hull abreast the magazines and a large leak on the top decks.

Following the opinion of a committee, it was decided to salvage the ship, adopting a system proposed by Lieut. General of Naval Constructors Edgardo Ferrati. The method consisted in making the ship float by filling her with compressed air, after repairing the leaks in the hull and closing all the airports and other side openings.

A special board was then organized in Taranto headed by Lieut. Colonel of Naval Constructors O. Giannelli, directly under a research officer of the Navy Department headed at first by Lieut. General Ferrati and Colonel E. deVito, then following the death of General Ferrati the most important and the final operations were directed by Lieut. General Carpi.

The work was at first hindered by the war, which did not permit the detail of many people and made it hard to get the supply of materials. This last difficulty was the main reason for a more important modification of the first plan which provided for the construction of a floating dock in order to keep dry and repair the overturned ship, when she had been freed from the bottom with the use of compressed air.

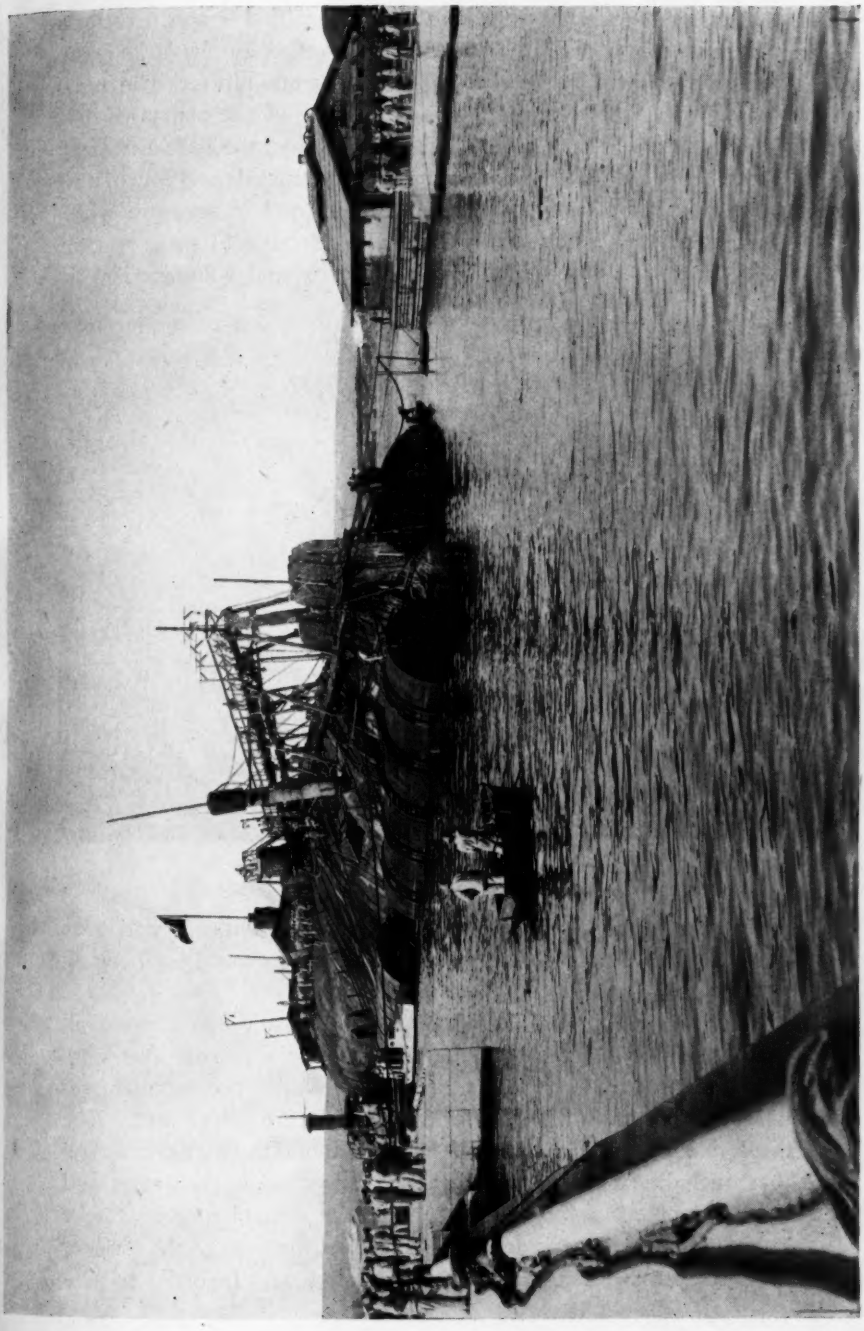
It was decided to place the overturned ship in the big dock of the navy yard of Taranto. This made it necessary to free the ship from gun turrets, conning-tower, smokestacks, cranes and other deck elements whose projection would not permit the ship to enter the dry-dock. After overcoming many difficulties, the ship was finally lifted from the place of disaster and put in dock, September 17, 1919, after a little over three years since she was

overturned. The recovery of the ship and the transfer to the dry dock, where she was placed bottom up to dry and for bottom repairs, the undocking and uprighting on the following October 5, was a triumph in the use of compressed air, which had been adopted throughout the whole work, and which permitted the ship to be entered under the water level and also under the mud level for the unloading of the ammunition and the detachment of the armored turrets which were left temporarily at the bottom of the sea. The compressed air also furnished the means to raise the ship from the bottom, and to keep her afloat during the transfer to the

GENERAL VIEW OF WORK PRIOR TO DOCKING.

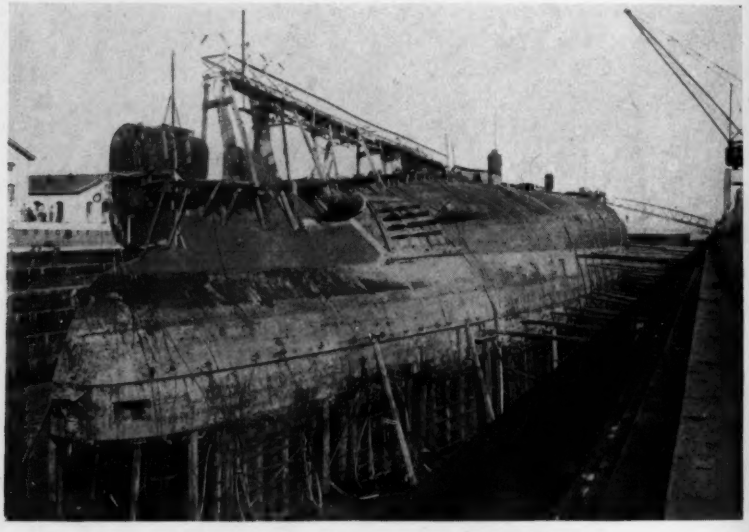
dry dock, and for the period necessary to place her on the transverse bearers provided.

The first phase of the salvage was successfully finished when the ship was taken to the dry dock; after that it was necessary to provide for the repair work prior to floating, then for the overturning of the ship. It also was necessary to provide for the recovering of the 12-inch guns which were at the bottom of the sea, together with their heavy armored turrets. These were recovered with the aid of special ring-floats invented by Lieut. Colonel Giannelli of the naval constructors who headed the work. These ring-floats must be submerged on the turrets and then emptied by compressed air when attached to the turrets. This process is very simple and can be employed also for the recovery of any heavy body.



VESSEL ENTERING DRY DOCK.

In order to keep the ship afloat in any position it was necessary to close and tighten all the openings, then to repair the large holes in the deck caused by the explosions of the ammunition. The overturning of the ship required also that many of the compartments must be flooded; so it was necessary to tighten the bulkheads and decks. The decks of the ship in the overturned position of the vessel would be subjected to a high hydrostatic pressure while those structures when the craft is upright have to support very little pressure. This added to the difficulty and volume of work

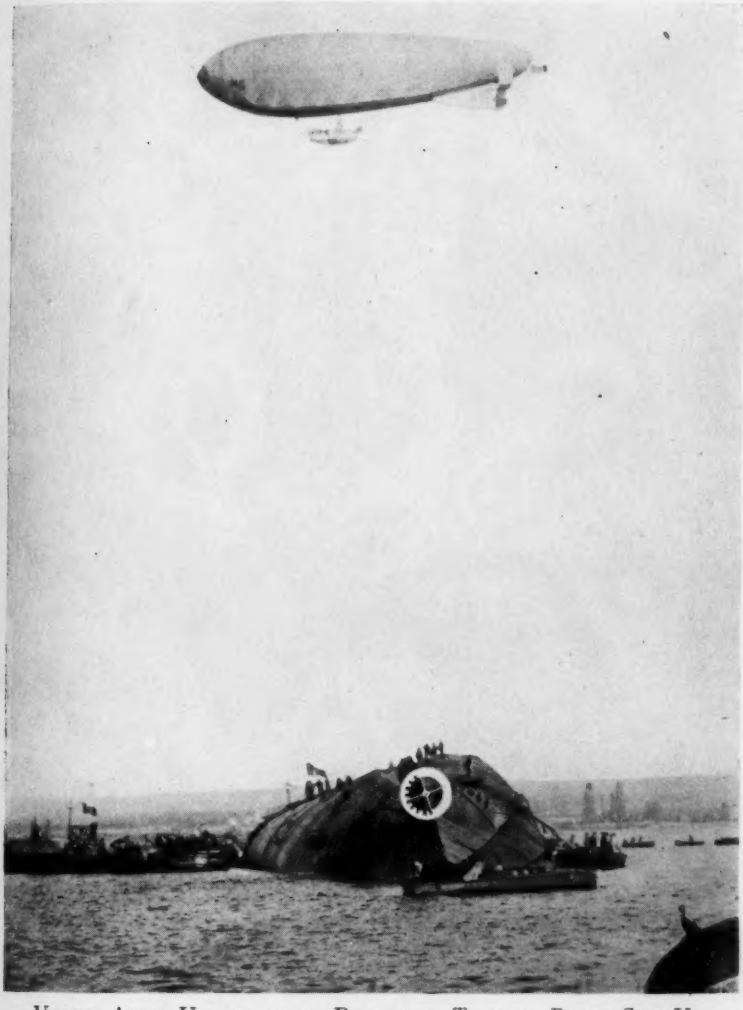


VESSEL IN DRY DOCK SHOWING SUPPORTS.

required. When all the work of tightening bulkheads had been finished, the overturned ship was floated from dock on December 16, 1920.

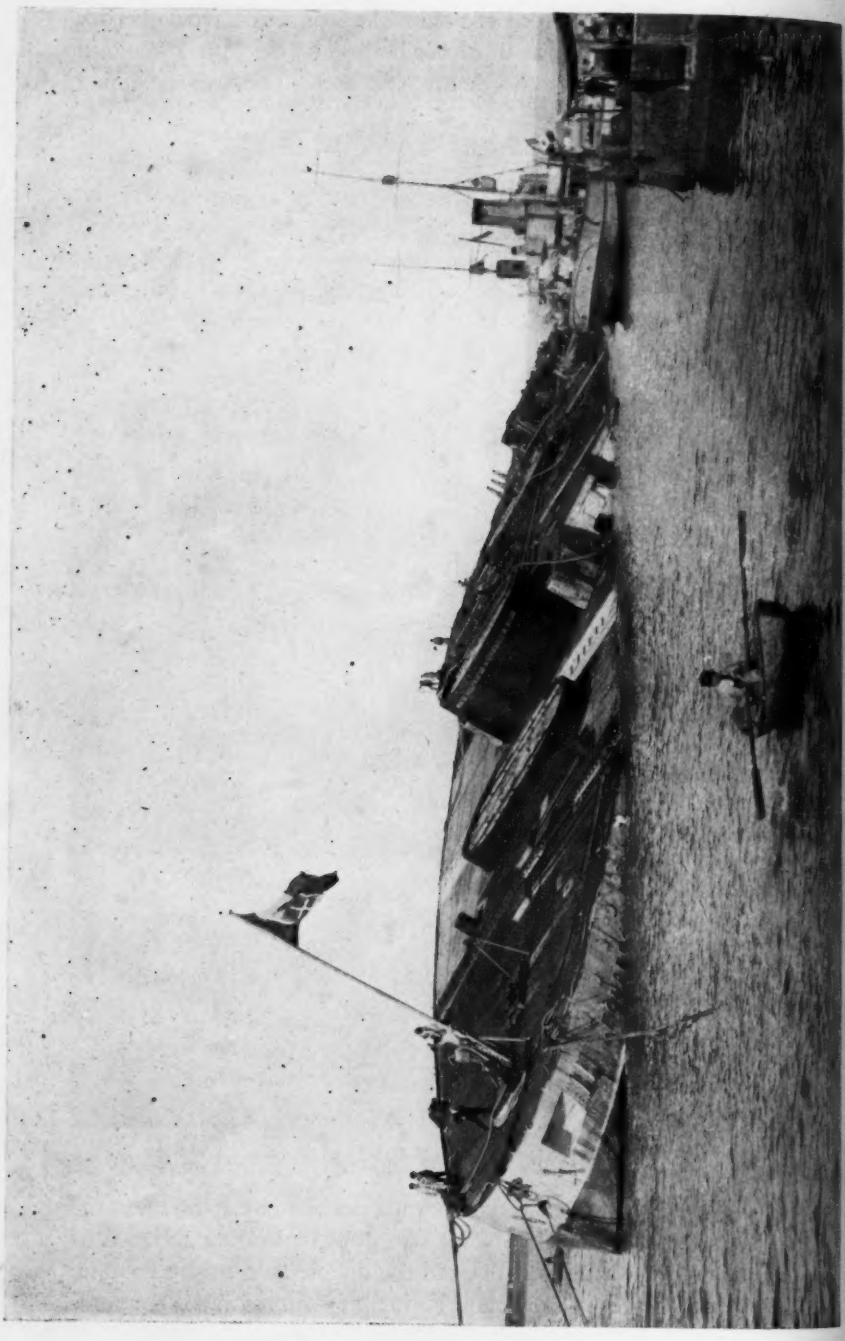
Very careful studies had been made in order to foresee all stability conditions during the rotation and the calculations were verified by model tests. By means of a stability test the displacement and position of her center of gravity were determined. The displacement of the overturned ship was found to be 18,000 metric tons, including the hull structure, the power plant, the armor and some equipment, minus 5-12" turrets, the control turrets, smoke stacks, cranes and some deck erections. At the time of the disaster the displacement was about 24,000 metric tons. In order to pro-

ceed with the uprighting of the ship, she was taken from the dry dock over a large pit dug out of the bottom of the Mar Piccolo in the north south direction to a depth of 60 feet. The task remaining

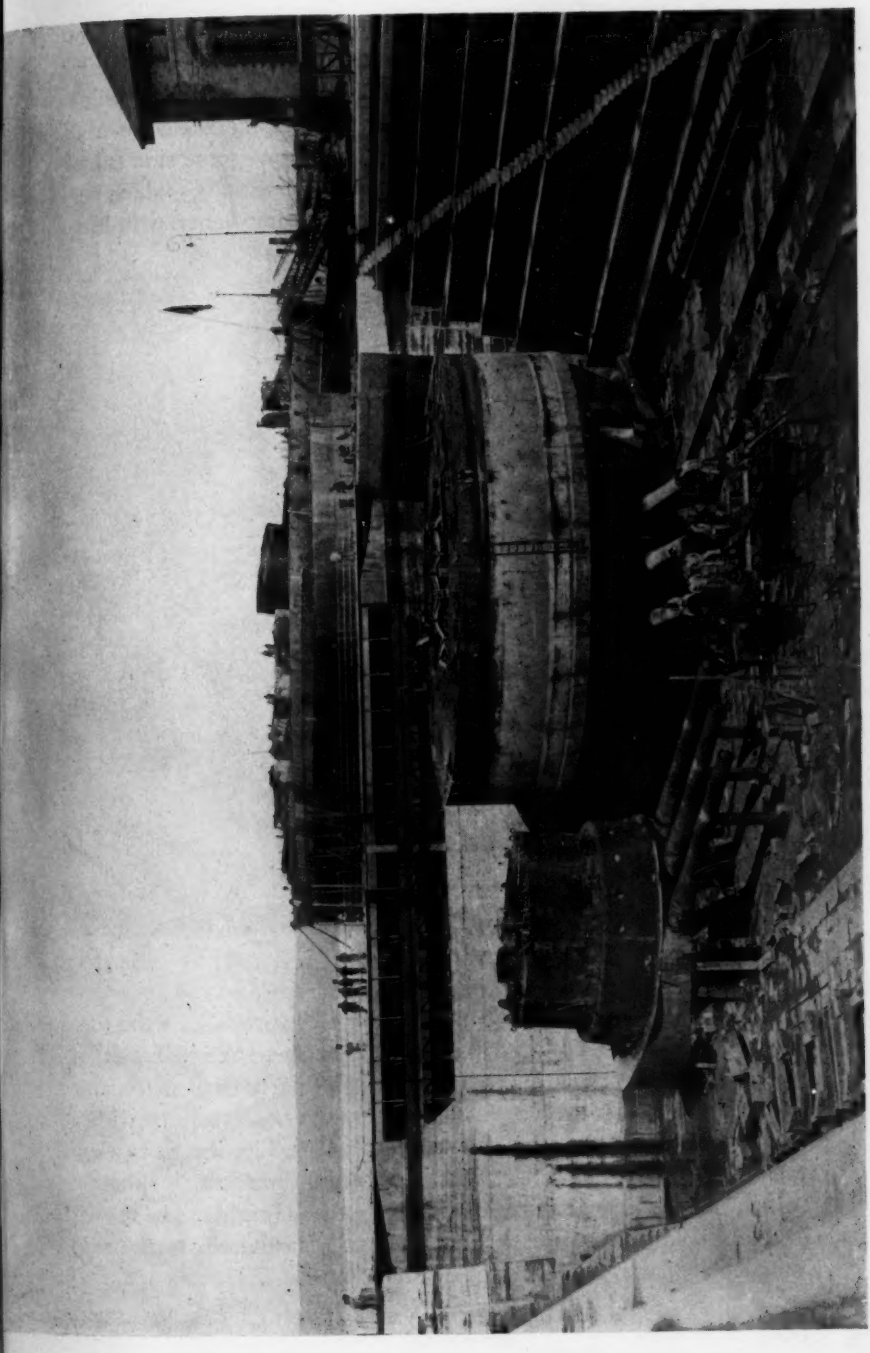


VESSEL AFTER UNDOCKING IN PROCESS OF TURNING RIGHT SIDE UP.

was to roll the ship over into its normal position, by rotation on the left side counter-clockwise. This was done by loading 400 tons of chain and cast iron ingot ballast in the double bottom; by flooding 2900 tons of water in the double and triple bottoms and other com-

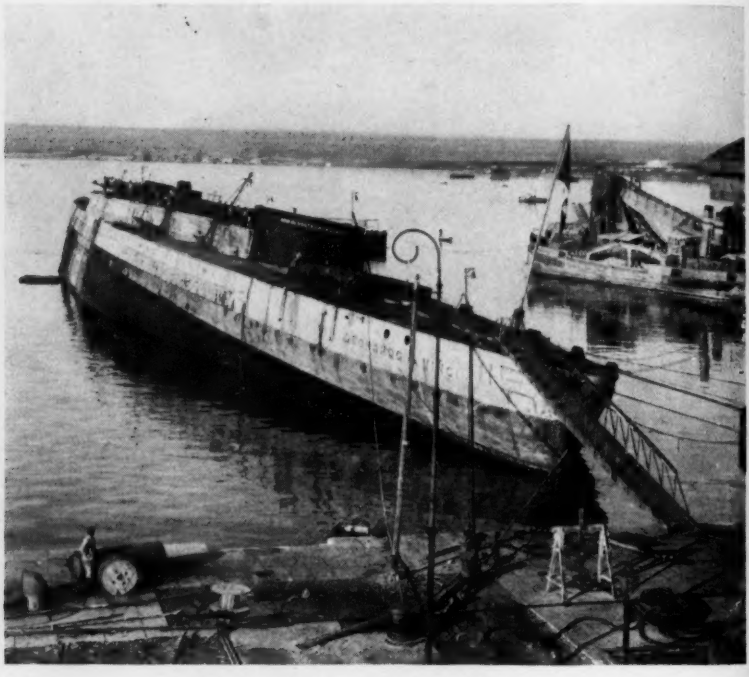


Vessel After Righting Being Towed to a Berth.



TWO OF THE TURRETS IN DOCK WITH LIFTING RING FLOATS IN PLACE.

partments, such as magazines, boiler room bilges and trimming compartments; by flooding the side ballast tanks with 3500 tons of water on the left side of the vessel. By loading these weights the inclination of the ship increased to 30 degrees with a total displacement of 25,000 tons. At that time automatic flooding of some side ballast tanks was provided for by opening special sluice valves which permitted the water to enter slowly enough to permit the crew to leave



VESSEL AT BERTH AFTER RIGHTING.

the vessel. These compartments had a total capacity of 1700 tons but only 850 tons were needed to bring the ship to an inclination of about 45 degrees, in which position a righting movement became effective which pulled the vessel entirely over. Naturally with a loading of about 1000 tons of water on one side, the ship when turned over would have her position of equilibrium at an inclination which had been calculated to be 22 degrees to the right. The results actually obtained completely confirmed the calculations as the ship stopped at that exact degree of inclination.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

RIGID AIRSHIPS

By LIEUT. COMMANDER GARLAND FULTON (C. C.), U. S. Navy

(CONCLUDED)

MODERN TYPES OF RIGID AIRSHIPS

The scope of this article will not permit a description of how a modern rigid airship is built nor a detailed description of its component parts, but having sketched briefly the outstanding steps in the evolution of the present-day rigid, it is proper that a summary be given of the functions of the principal parts of late types. The description will not apply to any one type of rigid, but will be more in the nature of an appraisal of the present state of the art.

A brief explanation of some of the fundamental terms used will prove helpful. Any airship derives its "lift" from the difference in weight of the ship and the displaced air. The total lift is the buoyancy, at ground level with all gasbags full. Variations in total lift depend primarily upon the volume of gas and density of the surrounding air. The capacity is the capacity of the gasbags when fully inflated. Fixed weights include: (1) Hull or structural weights; (2) fabric weights; (3) car and machinery weights, and (4) miscellaneous weights such as electrical and other equipment, crew, food, and ballast. The disposable lift is the difference between the total lift and the summation of fixed weights and is a measure of the ship's usefulness as regards fuel capacity and endurance. The maximum static height or ceiling is the height at which the ship will be statically in equilibrium with all dischargeable weights gone.

Construction of a rigid airship is both art and science in a high degree. The chief problem confronting the designer is the combination of strength with lightness. Considering the hull proper, on the one hand there is the lifting force of the gas and on the

other the weight of the hull structure, cars, engines, ballast, fuel, fabric, bombs, armament, equipment and personnel. Both of these opposing forces must be distributed as evenly as possible along the entire length of the ship. In addition, there are local forces due to the lift of each gasbag, thrust of propellers, handling and mooring and specially assumed conditions to take care of any possible attitude or internal condition of the ship. As with most design work, the determination of the components is dependent on previous experience. A condition is assumed and a stress worked out. By comparing with a stress worked out under the same assumptions for a successful ship, a judgment can be formed as to the suitability of the design. Load factors, or factors of safety, vary from three to six, depending upon the part under consideration, or may be even lower or higher in special cases.

As regards external appearance the profile may be divided into three distinct parts comparable to a surface ship—entrance, parallel body and run. Various form coefficients can be figured, the principal one being the slenderness ratio already referred to. The form affects materially the power required to drive the ship, and it is worth noting that the Admiralty coefficient long used as a criterion for comparison of similar surface ships can be applied with satisfaction to airships and furnishes a useful preliminary index to the power required for a new design.

While wood has been used in some rigids, the material universally used to-day for the bulk of the structural work is duralumin. This is an alloy of aluminum with about 4 per cent copper, 0.5 per cent magnesium and 0.4 per cent manganese. Its properties are susceptible of improvement by appropriate heat treatment and in its heat treated condition its strength is about equal to that of mild steel, while its specific gravity is 2.8, only slightly more than one-third that of steel. Its resistance to the corrosive action of salt water is better than that of steel. It was first discovered by a German named Wilm in 1903 and perfected by him during the succeeding eight years. License to manufacture was sold by Wilm to the Düren Metal Works who first produced it in quantity. The name "duralumin" is a trade name and appears to be a blending of the manufacturer's name, Düren, with "aluminum." It was 1914 before it became available in sufficient quantities to justify an extensive airship program. Licenses had been sold to Vickers,

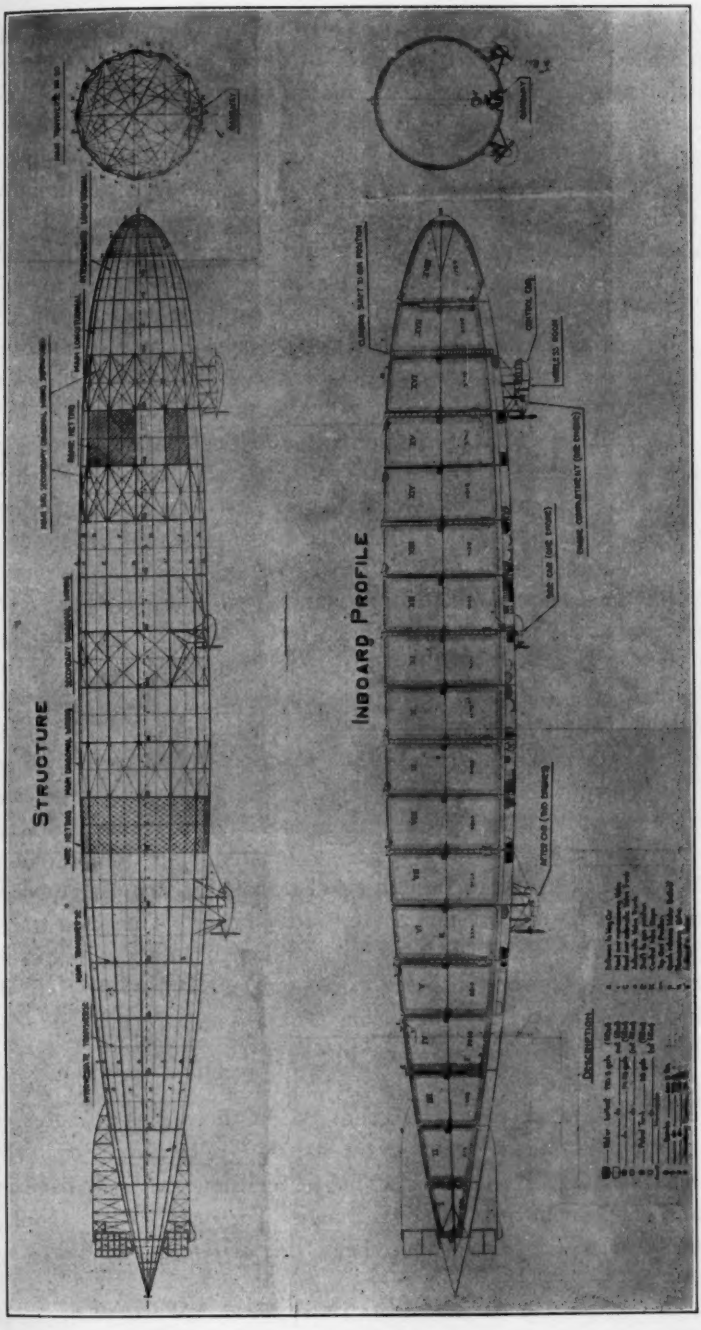


FIG. 10.—Diagrams of a Typical Rigid Airship.

who were soon able to produce equally satisfactory material, and to other foreign concerns. License to manufacture in the United States was allocated to the Aluminum Company of America and the Baush Machine Tool Company, by the Chemical Foundation under German patents sold by the Alien Property Custodian during the war. Both concerns now produce satisfactory duralumin on a commercial scale in the form of strip, sheet and forgings. Drawing tubing has thus far proved difficult, but progress is being made towards perfecting this process. Dr. Schutte has proposed to build a ship of tubular girders and if the inherent difficulties in satisfactorily joining intersecting tubes can be solved, such a structure should prove very economical. As airships grow larger steel, either tubes or shapes, seems to offer attractive possibilities.

The hull of a rigid is composed of lattice girders of various shapes and sizes depending on the particular work for which designed. Generally they are triangular in section and are formed by longitudinal channels at the three corners of the section, each face of the girder being braced by a series of crossed, light, corrugated stampings riveted to the channels and to each other where they cross. By this construction a girder 30 feet long may weigh only 10 or 15 pounds. The hull structure comprises a system of main and intermediate longitudinals running the full length of the ship supported at intervals by main and intermediate transverse frames. The longitudinals are spaced round the perimeter of the polygonal transverse frames at intervals of about 10 feet measured at the ship's greatest diameter. Alternate longitudinals are heavier than others and are designated main longitudinals. The number of sides to the polygonal frames is odd and in modern ships is usually 25, as viewed from the outside. The main transverse frames are each fitted with a system of brace wires in its own plane to maintain its polygonal shape, and enable it to fulfill its function as a strong ring preserving the transverse form of the ship. They are spaced equally along the length of the ship, generally 0.4 to 0.6 of the maximum diameter apart. On the first Zeppelins the spacing was 10 meters or about 33 feet, but this was increased to 15 meters or about 50 feet in the last ships to be completed. The inter-transverse frames are of lighter construction and have no transverse wiring in their own plane. They are spaced about 5 meters, or 16 feet, apart, there being one or two inter-transverses

between each pair of main transverses depending upon the spacing of main transverses. With different spacings of main transverses the arrangement may change, but probably not far.

A system of diagonal wires in the rectangular panels formed by the longitudinals and transverses on the facets of the 25-sided solid completes the hull structure proper. It remains, however, a most indeterminate structure. Considering the ship as a whole, at any section there will be a bending moment and shear forces and the basis of calculations goes back to the familiar beam theory as

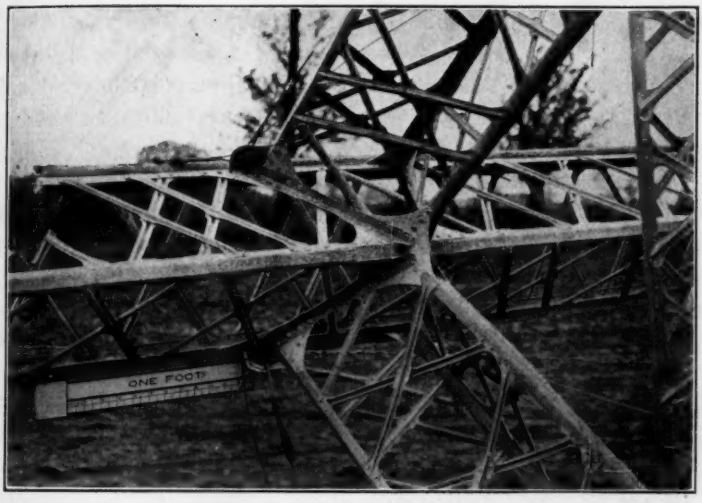


FIG. 11.—Typical Hull Girders Showing an Intersection. Photograph from *L-33* Brought Down in England, 1916. (Navy Dept. Photo.)

a first approximation. But this does not imply that all calculations are as straightforward even as present ship practice; they become very intricate and lead into places where no guiding light of calculation is possible, and one must rely on engineering judgment and past experience. Here the great difficulty is lack of authoritative data on previous types, but as time goes on this condition will gradually correct itself.

In early ships, the keel girder served to take most of the loads, but in later ships it is termed the corridor and its function is chiefly to distribute concentrated loads such as control car, power cars, bombs, fuel, and ballast, and to provide communication and

habitable space for the crew. In *ZR-2,* the corridor is of quadrilateral cross section the size of an average hallway ; a narrow walkway runs down the center with canvas pipe bunks, fuel tanks and ballast bags spaced on either side. Near amidships the walkway spreads out into a light platform to provide for cooking and messing. Access to the top of the ship, where there is a narrow fore and aft " cat walk " or crawlway, is by means of vertical access shafts suitably located.

The fabric outer cover, or envelope, contributes little directly to the strength of the ship, but serves to protect the interior parts and should be properly taut to present a smooth exterior and reduce resistance. This latter is of the greatest importance as about 70 per cent of the total resistance of an airship is chargeable to the hull and any slackness in the outer cover will act to reduce speed and endurance. The envelope may be of cotton or linen cloth, in general similar to that used for covering airplane wings, but usually of lighter weight. It is applied in longitudinal strips or gores which extend between each pair of main longitudinals and over from four to six frame spaces. The outer channels of main longitudinals are fitted with eyelets at close intervals and the gores are laced to the channels by cords which pass through the channel eyelets and corresponding eyelets in the edges of the gores. The strips of lacings along the longitudinals are closed by strips of fabric about 8 inches wide called sealing strips which are secured in place by " dope " which gives the necessary adherence.

Before manufacture into gores the envelope cloth is impregnated with some opaque pigment to prevent the passage of light which has a markedly deteriorating effect on the gas cells. After being laced tautly in place the exterior surface of the envelope is doped with cellulose " dope " to produce a contracting effect. This gives a smooth taut surface to the cover. The final outer coats are usually pigmented with aluminum powder which gives a fine reflecting surface and thus helps to minimize the superheating effect. Enough light must get through to the corridor by day to permit operations so the bottom panels are usually not pigmented, but are doped " clear."

Gasbags, the lifting elements, are placed in the compartments formed by the main transverse frames with their bulkheads of radial wires, and vary in number between 14 and 18 depending

upon the type of ship. Adding a section of parallel middle body with its additional gasbags is a favored method of increasing the capacity of a given ship. When in place they are supported against the bursting pressure of the gas, partly by the enclosing hull girders and the network of wires filling the areas between them, and partly by cord nets fitted over the bags and attached to the inner edges of various rigid members of the hull structure. An annular space of about 6 inches is left between gasbags and outer cover for ventilation.

The gas bags are made generally of cotton fabric lined with goldbeater's skins, afterwards coated with varnish to protect from moisture and handling, and to improve the impermeability. Goldbeater's skins are obtained from the " blind gut " of oxen, one skin comprising, say, two square feet, being obtained from each animal. For a large ship, perhaps 750,000 skins may be needed thus requiring a large herd of steers. The raw skins are packed in salt until ready to be stripped and put through various processes which finally result in a thin transparent sheet having a parchment-like feel. The processed skins are applied, sometimes single-ply, sometimes double-ply, to the cloth by means of a rubber solution adhesive. While the method is expensive, primitive, and the results not entirely satisfactory since gasbags remain a most delicate part of the ship and require rather frequent replacement, yet the use of goldbeater's skins secures extraordinary gas tightness combined with remarkable light weight. Considerable research has been done towards finding a satisfactory synthetic substitute and it is gratifying to be able to state that promising progress is being made. Good gasbag fabric should be durable under extreme temperature changes and considerable abrasive action and show a diffusion of not more than one liter per square meter per 24 hours, or for a large mid-section bag, about 0.01 per cent in 24 hours.

The size and shape of each bag is adjusted to suit its location in the ship. The largest when inflated will be like an enormous cheese about 80 feet in diameter by 45 feet long. Each bag is fitted with a spring loaded automatic relief valve, about 32 inches in diameter located near the lower part of one of the plane ends. A hand operated valve for maneuvering purposes may be provided at the top. Above all things the valves should be reliable, but in

practice this has been difficult to attain. If for any reason one gasbag becomes empty, a severe stress is imposed tending to bulge the wires in the plane of main transverses towards the empty bag.

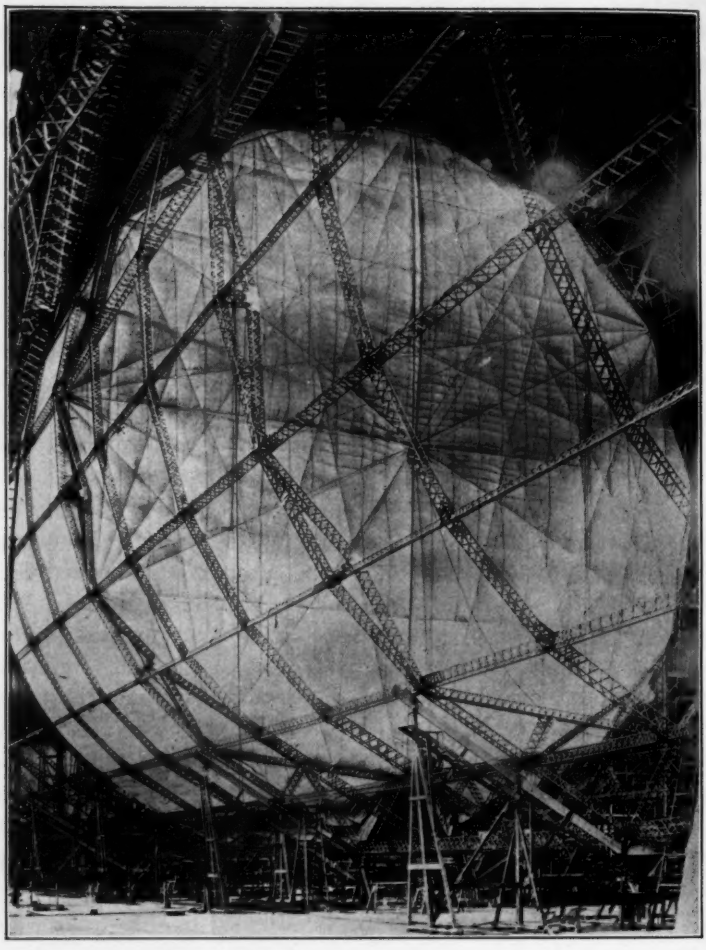


FIG. 12.—*ZR-2* Gasbag in Place for Test. Note Wiring and Diamond-Shaped Sides of Main Transverse Frames.

To assist in resisting this action an axial wire is led along the axis of the ship through the gasbags and secured to the wires of each bulkhead. Subdivision of the gas space is desirable for several reasons; it facilitates transverse bracing of the hull structure; it

insures against total loss of gas from a leak; it prevents excessive top internal pressures in case of steep inclinations of the ship; and it minimizes surging of gas with its disturbance to stability, analogous to the action of free water in a surface vessel's hold.

Water ballast for use in landing or correcting the trim of the ship is carried in large fabric bags each having a quick discharge valve capable of being operated from the control car. The amount of ballast carried varies between 3 and 6 per cent of the total lift and must be symmetrically placed about the center of lift, and so calibrated that the pilot can know instantly how much ballast should be discharged to correct the trim.

Any elongated body, such as an airship moving in still air, in the direction of its axis will, if inclined away from its normal path, encounter a moment tending to increase the inclination. The motion is, therefore, unstable and the measure to combat this is to fit stabilizing or control surfaces on the after portion of the hull, which can be operated to cause a counter moment. Control surfaces consist of vertical and horizontal fins (fixed surfaces) and vertical and horizontal rudders (movable surfaces). Proper design and proportioning of control surface is a troublesome problem. Usually four fins with rudders are fitted, one set above and one below on a vertical diameter, and one on either horizontal diameter. A cross sectional view from astern will thus show them to be symmetrically disposed in cruciform fashion. Recent fins are triangular in section and thick enough to be braced internally thus eliminating all but a few exterior guy wires. The rudders are usually balanced to facilitate operation.

Static stability requires that as much weight as possible be placed near the bottom, hence, control cars and power cars are found at the lower part of the hull. They are all built of duralumin and carefully streamlined. The forward car is on the centerline near the nose and is used for navigating the ship. It contains all navigating controls and instruments, and a separate compartment for the radio outfit and operator. It may either be suspended below, or built integral with the hull. In either case, access is via a hatchway to the corridor. Early ships mounted an engine and propeller in the after part of the control car, but the present tendency is to avoid this as too noisy for comfort.

The propelling machinery is divided into a number of separate units, each carried in a car slung from the under side of the hull. Each unit consists of one, occasionally two, engines driving through disengaging clutches and reduction gearing a pusher propeller at the after end of the car. Each engine has its own radiator. In some cases, with slow running engines the reduction gear is dispensed with. The number of power cars varies with the size of the ship, horsepower required, and size of engine available. Their arrangement is a compromise between best longitudinal spacing; placing cars as far up the side as practical to reduce head room and facilitate handling; and avoiding interference of propeller slip streams. Pairs of cars are usually symmetrical with the centerline. One or more of the after cars is provided with gears for reversing the propeller for checking headway on landing, or maneuvering near the ground. The question of car suspensions is one of considerable complexity. Besides taking the normal propeller thrust provision must be made for the ship taking an angle of pitch of perhaps 45 degrees up or down. The German system of suspension consists of a fairly rigid system of compression struts for taking the propeller thrust with tension wires to assist in taking the weight of the car. The British system has a minimum of struts which serve to maintain the car at a fixed distance from the centerline, the thrust being taken by a wire led aft through the propeller hub. Which is the better principle is a matter of opinion. Some provision should be developed so that a spare power car as a complete unit can be rapidly substituted for a car containing an engine in need of extensive overhaul.

The primary requirements of an airship engine are reliability over long periods and low fuel consumption. It has already been pointed out that since 1911 all German rigids have used Maybach engines of various sizes. In England a number of airship engines were produced, very efficient from a weight viewpoint, but not entirely satisfactory as regards reliability and fuel economy. Fairly good results are expected from the use of Liberty engines in *ZR-1*, the rigid now building in the United States. Other desirable characteristics of an airship engine are continuous running at high percentages of maximum horsepower; low revolutions; and simplicity and ease of overhaul while in the air. Weight of machinery is an important item and one in which improvements

may be expected. At present, an approximate figure of 13 pounds per B. H. P. may be taken for the weight of propelling machinery including cars with engines, and their installation. For continuous

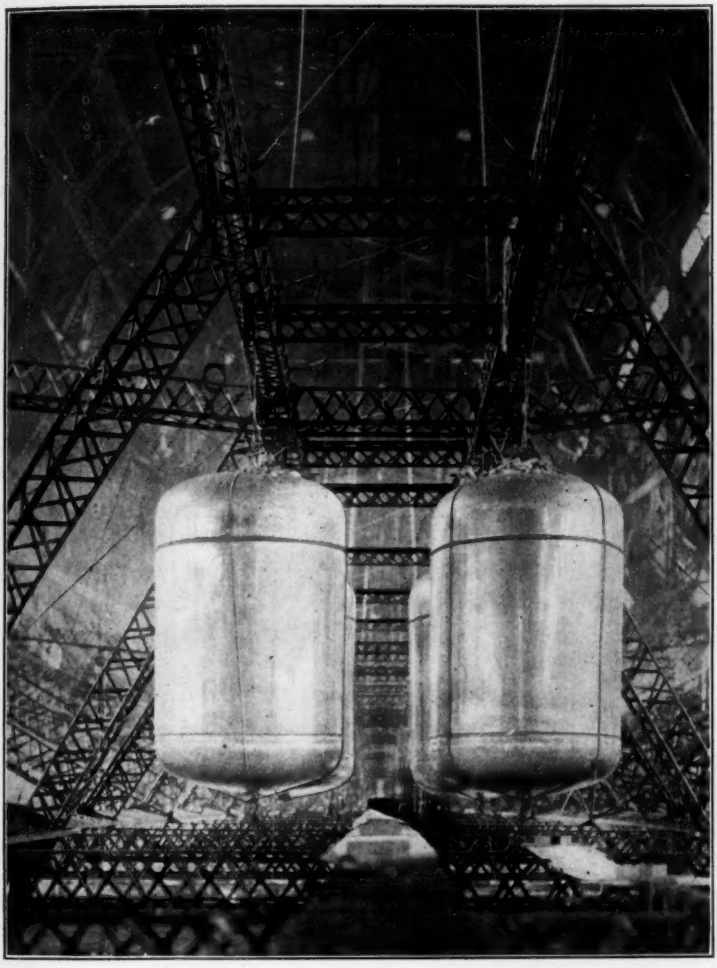


FIG. 13.—Corridor of *ZR-2* Showing Fuel Tanks. Each Holds 90 Gallons.

running speeds a fuel consumption of the order of 0.55 per B. H. P. per hour may be expected.

The fuel system comprises a number of aluminum tanks spaced along the corridor, some arranged to be quickly released and

others fixed, but all connected to one or two fore and aft mains which feed each power car. The tanks which can be released—known as "slip" tanks—can be dropped free of the hull, either empty or full, when it is desired to lighten the ship by more than the water ballast available, or in a fire emergency.

An airship making a long voyage has to contend with difficulties due to changes in temperature. Assuming an early morning start, as the sun appears she warms up and her lift increases due to superheating of the gas and to fuel consumed. Unless she is prepared to keep herself down by flying nose down, using horizontal rudders, she must rise and lose gas in doing so. In the evening when superheat disappears this loss of gas will be a serious embarrassment. To avoid this, it is necessary to add weight to the ship. A promising method designed to accomplish this is to condense and recover water from the exhaust. Very satisfactory experimental results have been obtained, but to get 100 per cent recovery in service requires very heavy condensers. It is also certain that during a flight it will be necessary to discharge gas, and an alternative economy is to provide for burning as fuel a mixture of gasoline and hydrogen. Use of either or a combination of these two methods of adding weight would permit the airship commander to control his altitude almost without regard to atmospheric changes. It is expected one or both of these schemes can soon be declared beyond the experimental stage and placed in service.

It is unquestionably true the fire hazard in any airship is very great. This danger is commonly thought to be due to the presence of hydrogen and one sees articles dealing with the desirability of adopting helium at any cost. A far more important question which is often completely ignored is that of fires due to the fuel installation. Setting aside attack by hostile aircraft, the danger of primary fire from gas is small for hydrogen takes a good spark to become ignited and reasonable precautions will prevent it. Gasoline must be recognized, however, as the greater menace and so long as it is used the most stringent precautions should be taken. The fuel system extends practically the whole length of the corridor and invites accumulation of gasoline vapor, but with proper precautions to have the system tight and adequate ventilation of quarters, corridor, and cars the danger of fire from this source will not be

great. It will be still further reduced if engines can be developed to use kerosene or other fuel of high flash point instead of gasoline.

The great military advantage of invulnerability to incendiary projectiles makes the use of the inert, non-combustible gas helium of great value in the presence of an enemy. Helium has about 92 per cent the lifting power of hydrogen and about 65 per cent as rapid diffusion. It is being produced in the United States to-day in limited quantities, but it will be considerable time before it can compete with hydrogen in cost and undue insistence on the advantages accruing from its use does not seem desirable at present. It has been suggested that hydrogen-filled gasbags may be surrounded by an annular space filled with some inert gas as the Germans are reported to have done with kite balloons during the war to save them from incendiary bullets. Possibly some scheme of this sort can be worked out though its efficacy remains to be proved.

Although a rigid can navigate in almost any weather while in the air, the question of handling when making a landing or near the ground presents many difficulties and is a handicap to their greater utility. The problem of landing a rigid without human labor is one that has engaged designers for years. A great many devices have been proposed or tried, such as docking rails, and wind screens, but while these assist in getting the ship in or out of the shed, there is still the problem of handling from the time she approaches the ground until the mechanical devices may take charge. Buffer bags are provided under each car and give a useful cushioning effect besides furnishing flotation when alighting on the sea. Handling frames are provided at landing fields to be clamped on the hull as soon as it is brought within reach, and furnish grips for a large number of men. To keep the ship from rising and to guide her while moving about the field a number of handling guys are led from various strong points on the hull. Besides requiring great skill and judgment on the part of the airship commander in jockeying his engines and water ballast, the latter sometimes to the discomfort of the ground crew, the evolution of landing requires the services on the ground of perhaps 400 men who must be thoroughly drilled in their duties. Thus while the evolution is similar to warping a liner to her pier or placing a large ship in dry dock, it is a three-dimensional instead of

a two-dimensional problem and, hence, more difficult. A new kind of seamanship or "airmanship" is required.

Recent success in England with an improved type of mooring mast and a new method of approaching it promises to remove a large part of the troublesome handling problem, and to reduce the number of expensive sheds required. The mooring mast is a steel lattice structure similar to a radio mast and somewhat over 150 feet high for a 600-foot ship. At the top, mounted in gimbals so that it may tilt, is a pedestal enclosing a telescopic tube carrying

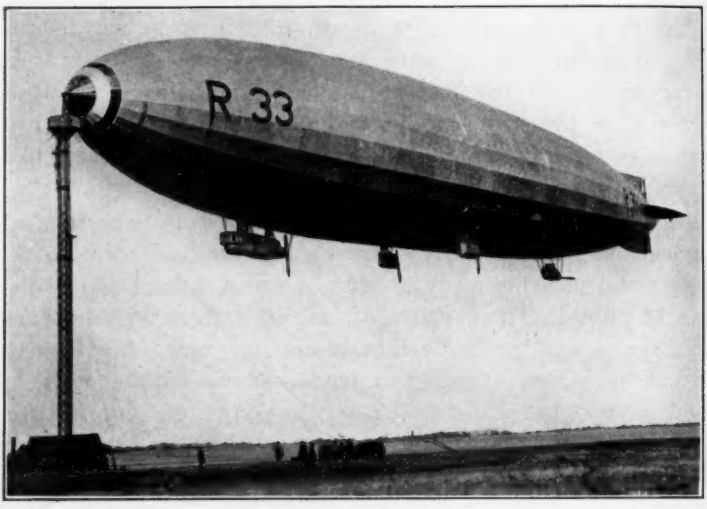


FIG. 14.—*R-33*, Sister Ship of *R-34* of Transatlantic Fame, Riding to Mooring Mast.

a bell-mouthed, conical cup at its upper end. The nose of the airship is strengthened and fitted with a short horizontal outrigger to which is hinged a cone designed to fit into and lock with the mast cup. A hauling-in cable controlled by a winch is led up the mast, through the telescopic tube and cup and down to the ground perhaps a thousand feet from the base in the direction of approach. When the ship, approaching from leeward and properly trimmed, is hovering about 500 feet over the end of this cable, a ship's cable is dropped from the nose fitting to the ground and shackled to the mast cable. Ballast is discharged, the ship rises, and it would seem to be a simple matter to haul her to the

mast and secure her, but in practice it was found the ship had a tendency to swing forward into the wind and surge about in dangerous fashion. The modification proposed by Major Scott, who commanded *R-34* on her voyage to this country, to overcome this and recently adopted, is very ingenious. Blocks are spaced $7\frac{1}{2}$ degrees apart on the circumference of a 1000-foot diameter circle having the base of the mast for its center. When the ship has been hauled in by the mast cable to a height of about 300 feet above the mast, two guide ropes, also attached to the nose, are

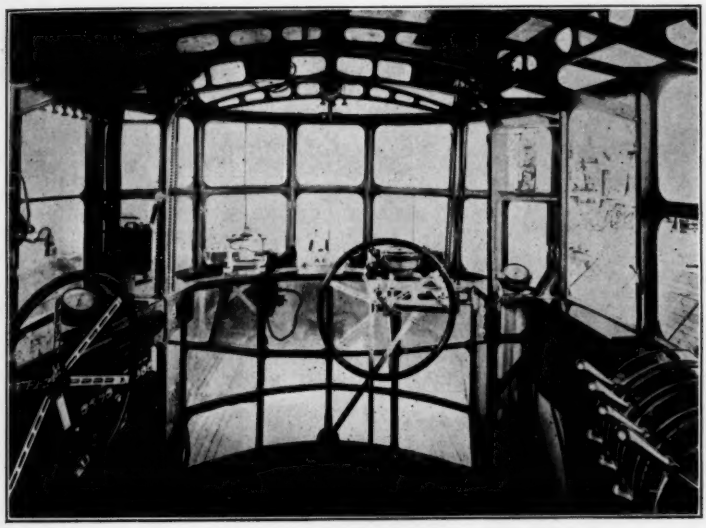


FIG. 15.—Interior of Control Car.

dropped and shackled to two ground ropes, each controlled by a winch. These are led through two of the ground blocks symmetrically situated and about 60 degrees each side of the wind direction. The guide ropes are hauled in simultaneously until predetermined marks arrive at the ground blocks and are there held. The ship is then above the mast, her nose securely held by two guide ropes forming the sides of an isosceles triangle. As the mast hauling line is hove in the nose must describe an arc of a circle the center of which is on the base line of the triangle; thus by keeping tension on the three lines the nose cone is drawn straight into the cup and the cone and cup locked together without difficulty.

The guide ropes and ship's cable are released and returned on board; the telescopic tube is secured in an upright position; and the mooring is complete.

This evolution, while calling for great skill, requires only a handful of men and has been executed under severe wind conditions and also at night. When secured the ship can ride to the mast for an indefinite period swinging around freely with the wind with two or three men on board to adjust trim. The remainder of the crew may leave through a small hatch in the nose and climb down the mast. Fuel and water are supplied via the same nose hatch. The reverse operation of casting off from the mast is more simple and need not be described.

The general operation of a rigid is not unlike that of a surface ship and the analogy is particularly close in the case of submarines. While underway the ship is navigated from the nerve center in the control car forward. To this car lead engine telegraphs and telephones from each power car; rudder controls; maneuvering valve controls; ballast valve controls; bomb releases; and similar apparatus required for operating the ship. The radio room is immediately adjacent to the control station. An auxiliary control position is generally provided in an aft location. Suitable sleeping and messing accommodations are provided for the crew of perhaps thirty officers and men. Cooking is done by electricity or engine exhaust and is served on folding tables. Electric lights are provided as are small electric blowers for ventilation when not underway. The natural draft due to the ship's motion furnishes ventilation while underway and electric heaters are a necessity at the higher altitudes. In flight, watches are stood in sea-going fashion. There is in each watch at least the officer of the watch; a navigating officer; an observation or meteorological officer; a height coxswain; a direction coxswain; a radio operator; one engineer for each power unit; two or three engineers for fuel supply; and two or three general hands for inspection of gasbags, hull, and patrol of the ship's interior. The operations of gassing, fueling and ballasting the ship, while in her shed or preparatory to flight, need not be gone into here, nor the routine of checking up on gas purity, tautening outer cover, nor inspection of valves, wires and hull structure. It is worth noting that when a ship is to be in her shed for any considerable period, or when gasbags are deflated the

weight of the ship is taken by a number of slings secured overhead to the shed structure. When in this condition the ship may be said to be "docked."

UNITED STATES DEVELOPMENT

Active interest in the design of rigid airships in the United States dates from July, 1916, when, at the request of the Bureau of Construction and Repair, the various naval attachés in Europe were urged to furnish information regarding the construction and use of rigids. Special inquiries were made as to goldbeater's skin and such other special materials as were then in use. Samples of duralumin from *L-3* wrecked off Jutland in 1915 and *L-20* wrecked on the Norwegian coast in 1916, were received through a naval attaché and the development of similar material in this country was at once urged and encouraged. In October two draftsmen started as a design problem, based on such meager information as was then available, weight estimates and preliminary calculations for 500,000-, 700,000- and 800,000-cubic-foot ships. This work continued to the point where sample girders were made up from an aluminum alloy and tested.

About this same time a board of army and navy officers was appointed to consider the policy that should be followed as to the development of rigid airships. This board recommended that to facilitate effective cooperation in regard to rigids an Army and Navy Airship Board be created with the chief constructor as senior member; that a rigid airship be designed and constructed under the direction of the chief constructor; and that expenses be borne equally by the army and navy.

This Airship Board was appointed and met in February, 1917. It received a report as to the earlier activities of the Navy Department, and after discussing several suggested methods of obtaining a rigid airship and weighing the resources of those private corporations who professed a readiness to build such a ship, decided to try to obtain a design, or a complete ship, from abroad at the same time proceeding with the work already begun of designing a small 700,000-cubic-foot rigid at least to the point where contract plans could be issued to a private firm. Work on this design was continued within the organization of the Bureau of Construction and Repair. The services were obtained of a Swiss citizen who

claimed to have the design of a wooden girder rigid of about 1,500,000-cubic-foot capacity, similar to *R-31* then building for the British Admiralty and design energy was shifted to this larger ship. Information received from abroad in late 1917 disclosed the fact that so many changes had been made in late British ships, evidently based on lessons learned from experience in the use of rigids, that it was considered advisable to completely revise the design. It was discovered that although he had contributed valuable information, nothing further could be learned from the Swiss citizen's design, and he was released. Aside from considering questions relating to the airships, this "Zeppelin Board," as it was commonly called, discussed and made recommendation on Argon gas (helium), sheds and other related problems. It was also called upon to consider a number of proposed designs, nearly all of them freaks, from ambitious inventors or promoters.

In March, 1918, the board sent a special mission abroad to obtain first-hand the latest results of Allied work in rigid airship design, construction and operation. This mission returned in July and a final report from the board was submitted to the Secretaries of War and Navy shortly thereafter. The report recommended that if any rigid airships were wanted for use by either the army or navy in the zone of operations of the war, they be got by purchase in England; that if any were wanted for use from home bases they should be constructed in the United States in an effort to establish the art in this country; that such design and construction should be handled under existing organizations rather than by a joint board; and in view of the very evident use the navy might have for large airships, the Navy Department was the logical organization to handle the work; and, finally, a building program of four (4) rigid airships was suggested. This report was accepted by the Secretaries of War and Navy and referred by the Navy Department to its General Board for consideration. The General Board recommended in September, 1918, that two (2) rigid airships be purchased in England, and that the building of two (2) hydrogen filled airships be undertaken in this country at once. A recommendation of The Joint Board that the Navy Department be charged with the development of rigid airships, including their incidental acquisition in foreign countries, was subsequently approved by the Secretaries of War and Navy. No

restrictions are placed, however, on their use by either service after development.

The acquirement of rigid airships was mentioned before Congress in early 1918 in connection with war-time naval appropria-

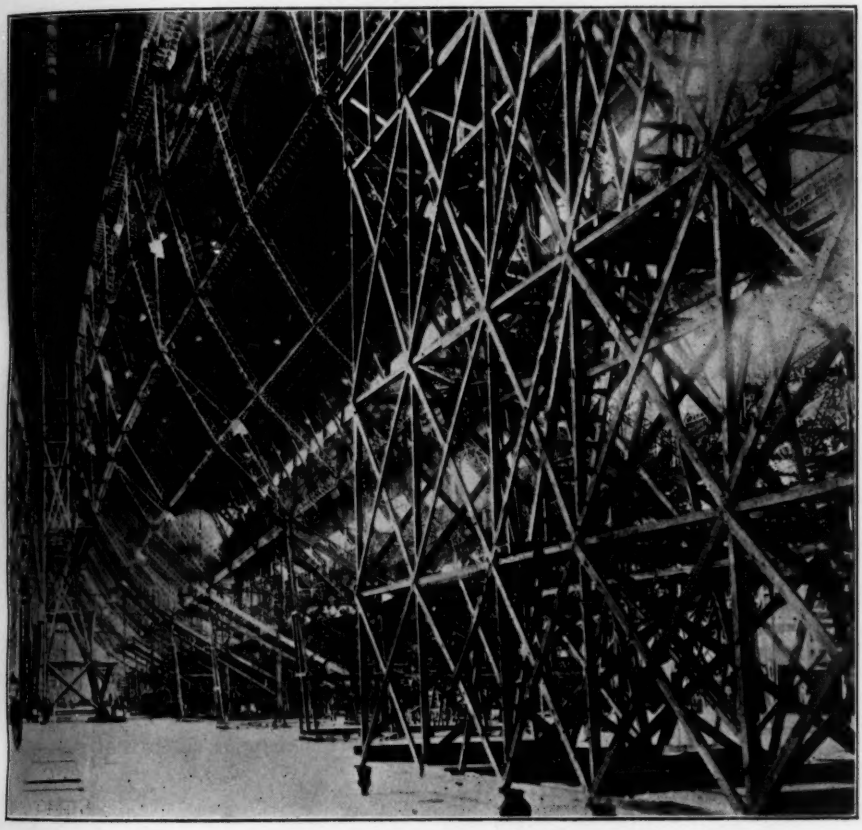


FIG. 16.—*ZR-2* in Process of Erection.

tions and the aviation estimates submitted in October of that year for the fiscal year ending June 30, 1920, contained items for the four rigids recommended by the General Board and two large sheds. In hearings on these estimates in November the policy of acquiring rigid airships for the United States was discussed. The Armistice had intervened since the estimates were prepared and

necessitated a very radical reduction. In this reduction Congress saw fit to eliminate the items relating to rigid airships and sheds. The importance of the project was emphasized by the Navy Department in the Spring of 1919 with the result that as finally approved July 11, 1919, the Naval Bill appropriated $1,500,000 towards the construction of one rigid airship; $2,500,000 for the purchase abroad of a second; and about $3,000,000 for the construction of sheds for two large dirigibles. The inclusion of these items had

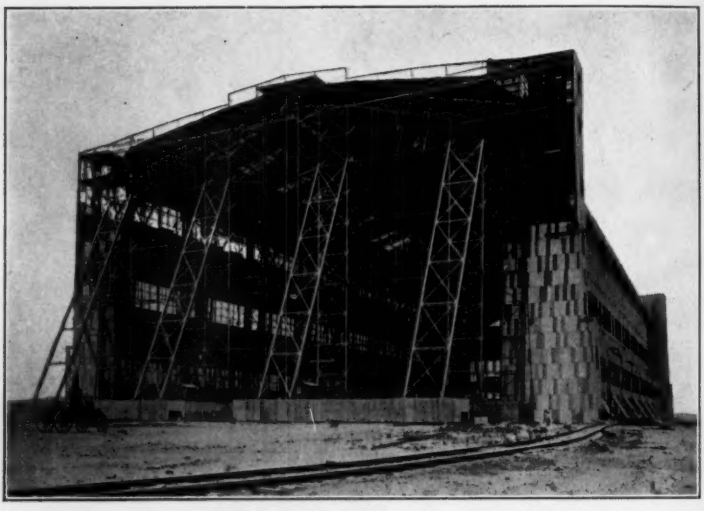


FIG. 17.—Airship Shed at Lakehurst, N. J. The Largest Shed in the World and Capable of Housing a 10,000,000-Cubic-Foot Airship. (Navy Department Photograph.)

been anticipated and plans were ready for prompt execution immediately funds were available.

A survey was made of all likely locations on the East coast for a large shed. The place finally selected was an abandoned army camp near Lakehurst, New Jersey, about half-way between Philadelphia and New York and some 50 miles from the coast. While it approximates a satisfactory site as regards meteorological conditions and has somewhat more than the minimum of one square mile of level, cleared ground, its choice was largely one of expediency. It was the only near-satisfactory site that could be obtained. Contract was at once let for the world's largest shed

to a preliminary design worked out by the Bureau of Yards and Docks. It is 800 feet long with cross section 250 feet wide by 172 feet high in the clear, and will house a pair of 5,000,000-cubic-foot ships or a single 10,000,000-cubic-foot ship provided a 200-foot extension be added. This shed is now practically complete and will be surrounded by a large hydrogen plant, shops, barracks, and by recent decision, a 160-foot high mooring mast, to make at Lakehurst a complete station for construction and operation of large airships.

For the airship to be constructed in this country, *Fleet Airship Number 1*, the Department in July approved a 2,000,000-cubic-foot design substantially similar to the German *L-49* except that it will be adapted to use American power plants, including Liberty engines, and American materials. She will not, however, be a Chinese copy, as advantage has been taken of every opportunity to revise the design as the work proceeds in accordance with the latest information received from abroad and a number of improvements have been incorporated that will make it equivalent to the later German ships. Officers have been sent abroad to study the latest British and German practice and some experienced foreign talent has been obtained to assist in placing this new form of shipbuilding on a rational basis.

Due to efforts started in 1916, all the required materials, including duralumin, are to be available from American manufacture for the construction of the ship. The necessary special tools, jigs, and erection devices have been prepared, contracts let for nearly all of the materials such as gasbags, reduction gears, etc., and fabrication of metal parts is underway at the Naval Aircraft Factory, Philadelphia. Erection of the ship is to be in the shed at Lakehurst although the failure of Congress to provide adequate funds for the completion of the ship makes its future uncertain at this time.

The designation of the ship has been changed from *Fleet Airship Number 1* to *ZR-1* to conform to latest departmental practice. The new designation is not a combination of German and British symbols, as may occur on first thought. It is merely coincident that the symbol "Z" selected for all types of airships combined with "R" for rigid type gives a hybrid appearing designation.

While practicable to develop rigid airship building with the information at hand and on our own resources such a course would require a number of years and be expensive. Therefore, executing the authority given by Congress, negotiations were opened abroad in the summer of 1919 with a view to obtaining the full benefit and value of the development there. The high water mark of this development was undoubtedly in Germany, but since peace had not been consummated by the United States it was, although considered, not possible to obtain by allocation a late German rigid even if it had been our policy to accept it, and if we had possessed a shed to receive it, which we did not. Further, in view of the provisions of the Treaty of Versailles which prohibited the manufacture of aircraft in Germany for a period it would have been most undiplomatic to have placed even through an intermediary an order for a new German ship. Negotiations were, therefore, opened at once in England with a view to purchasing a rigid airship and also to get advice and technical assistance in the construction of *ZR-1* in the United States. Personal inquiries had been made along these lines by officers from the Department several months previously and paved the way for the final negotiations. Preliminary and more formal inquiries now made of the British Air Ministry met with the most cordial response and the extent to which they would extend advice and assistance to us was referred to the British Cabinet as a matter of national policy. The Under-Secretary of State for Air expressed pleasure in the most cordial terms at the opportunity to cooperate with the United States in the future development of the rigid airship and this was given immediate effect by their offer to sell to us *R-38*, under construction at Short Bros. (now under Air Ministry), which represents their latest development in all particulars and is the largest airship ever laid down.

The agreement as drawn up with the Air Ministry includes complete plans and specifications; provides that the ship shall be built entirely to Air Ministry designs and practice; and provides for the closest cooperation, evidenced by two visits to this country by Constructor-Commander C. I. R. Campbell, R. N., in charge of rigid airships for the Air Ministry, and by permission for American officers to be resident at the building works. As a separate matter, also meeting with hearty cooperation, arrangements were made to train in England a complete American crew of officers and men to fly *R-38* to the United States on her completion.

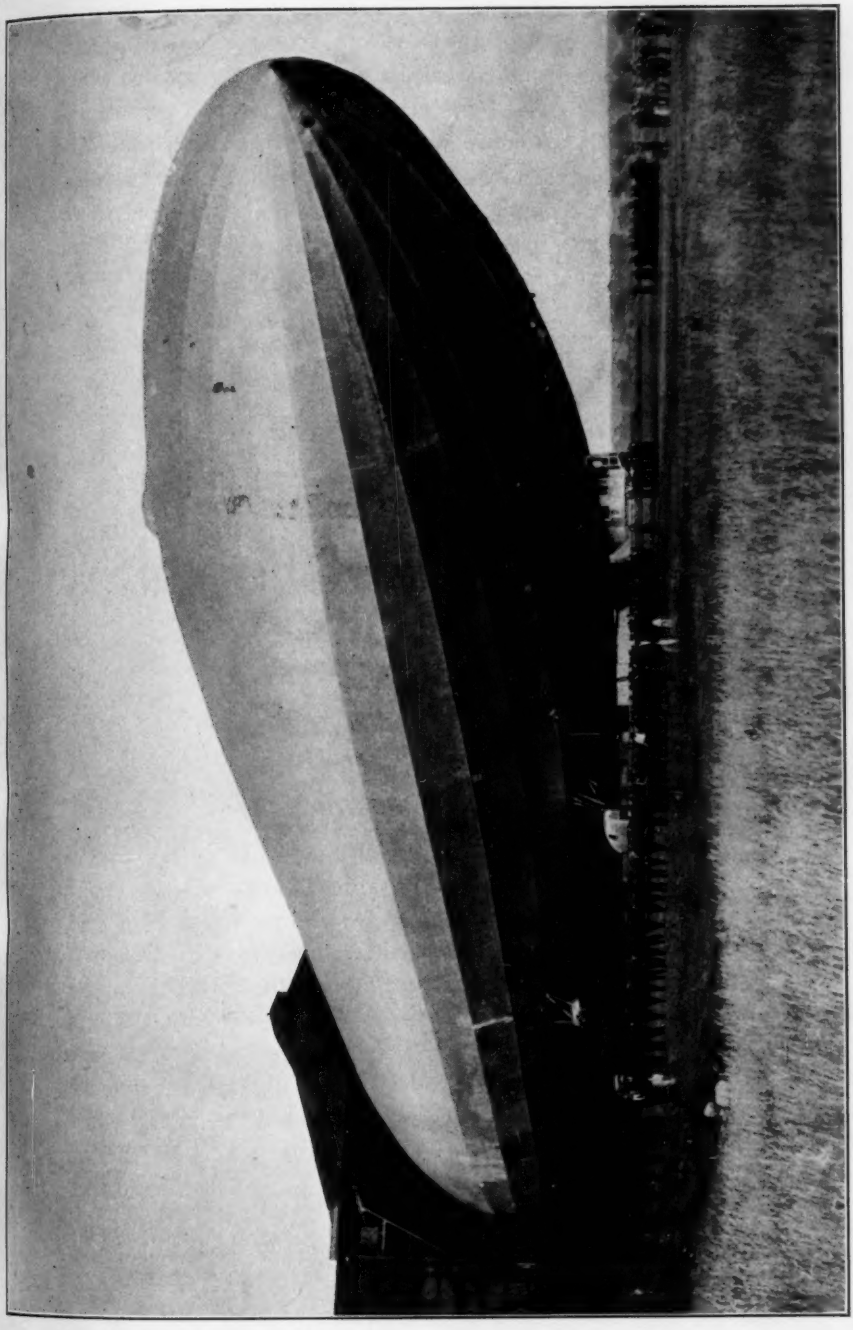


FIG. 18.—*ZR-2* Being Hauled Out of Shed. (Navy Department Photo.)

The price paid for *R-38* was to be actual cost to the Air Ministry which was estimated, and later definitely fixed, at $2,000,000 which is inclusive of the cost of inspection and trials, hull spares, and machinery spares, amounting to about one-fifth the cost of the ship proper. The cost to the Air Ministry will likely be in excess of this figure but a duplicate ship could be built for about three-fourths the amount. Being a single ship of a new type built in a large plant the costs run somewhat high.

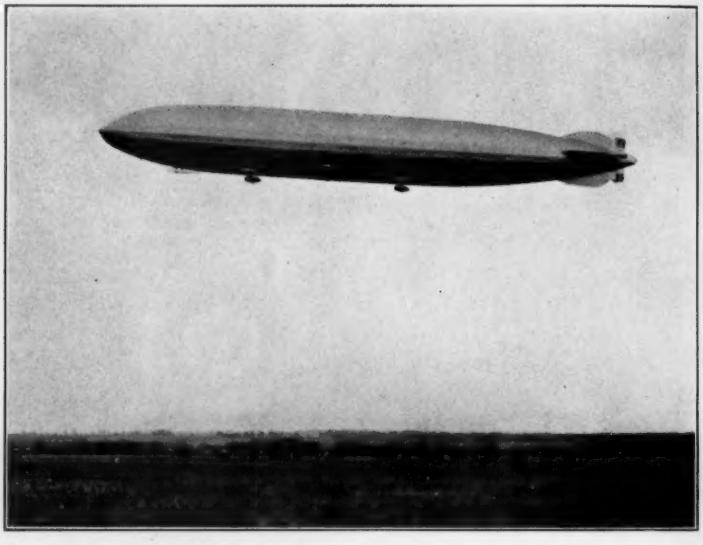


FIG. 19.—*ZR-2* in Flight. (Navy Department Photo.)

R-38 was designed in 1918 by the Admiralty staff as a reply to the large high-flying German rigids of the *L-71* type. She is not a copy of German ships but is entirely a British conception. She is 300,000 cubic feet larger than *L-71* and is only exceeded in size by designs that exist on paper. The design has been worked out especially for naval purposes and has been kept as light as possible for the high altitude work the latter stages of the war proved was so essential. Originally it was proposed to build three ships of this class, but two were canceled just before construction started in November, 1918, leaving only *R-38* at the works of

Short Brothers in Bedford. These works have since been taken over by the Air Ministry.

Advantage has been taken of the somewhat slow progress of construction to introduce improvements and additions such as bow mooring gear. The car arrangement is similar to late Schutte-Lanz ships. The control car with radio room is rigidly attached to the hull well forward. There are three pairs of wing power cars of clean shape each car with a 350-horsepower Sunbeam engine, and arranged so that no propeller is on the center-line of the ship. The results of trials are not yet known, but the following are the principal design dimensions and performance characteristics:

Volume	2,724,000 cu. ft.
Length	695 ft.
Diameter	85.5 ft.
Height overall	93.0 ft.
Total normal lift	83 tons
Useful lift	50 tons
Percentage useful/gross	60.2%
Full speed	69-70 miles per hour
Endurance at full speed	5000 miles, or 73 hours
Cruising speed	55 miles per hour
Endurance at cruising speed	8000 miles, or 146 hours
Ceiling (estimated)	24,000 ft.
Total horsepower	2100 (6-350 H. P. Sunbeam engines)
Fuel capacity	30 tons (50 tanks, 190 gals. each)
Number of gasbags	14
Normal crew	28-30 officers and men
Armament	14 machine guns
	1 one-pounder
	4 520-lb. bombs
	8 230-lb. bombs

While non-rigid and semi-rigid airships have rather distinct limits as to their economical size, the rigid airship is a different proposition and its limit has certainly not yet been reached. Generally speaking the larger an airship is the more efficient it can be made. At their present stage of development rigid airships can carry a cargo of 25 tons 5000 miles over land or water, or both, at a speed 50 per cent greater than that of an express train; or, with a maximum fuel load and no cargo, can similarly travel 9000 miles or more. They can navigate in all sorts of weather and, if necessary, circumnavigate storms, go to altitudes of 20,000

feet to avoid them, or hover and wait for a fog to lift. They may be moored to a mast for days and can carry out routine repairs to engines and equipment while underway.

The necessity to any naval power of such ideal scouting craft, able as each is to scout the same area as three scout cruisers, is obvious; likewise, it is obvious that any use of large airships over the sea is essentially naval. Airships in themselves are of relatively small offensive value, and must be developed to coordinate with the surface and sub-surface fleet and its other types of aircraft. To a naval power which develops aerial cooperation with the fleet along sound lines, airplanes and airships will be a vast accession of strength.

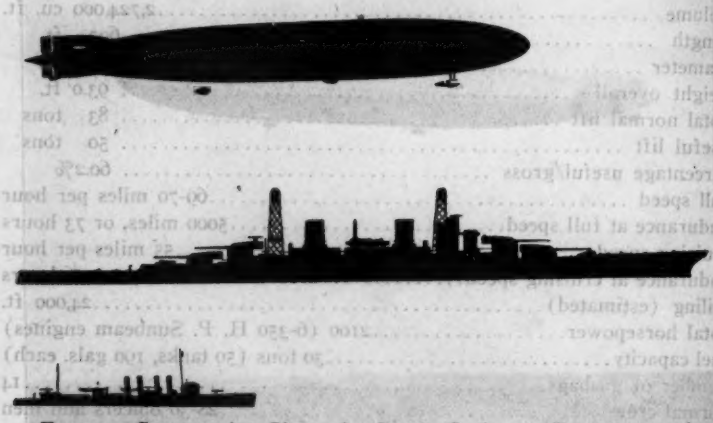


FIG. 20.—Comparative Sizes of a Battle Cruiser, a Destroyer and a 2,000,000-Cubic-Foot Rigid Airship. *ZR-2* Was 725,000 Cubic Feet Larger Than the Airship Shown Here. (Navy Department Photo.)

Vulnerability is an undisputed military handicap to rigid airships and whenever one has been lost the Jeremiahs have been prompt in declaring the type worthless, but the history of warfare shows that for every method of attack there is a defense and the advantage fluctuates with progress. Even now at her customary high altitude the large airship is unconcerned by mines, torpedoes, gunfire from surface ships and fortifications, or attack from any airplanes but the extremely high powered types able to climb above 18,000 feet. In a war against a modern fleet the present-day rigid might, if caught unawares, fall a victim to incendiary bullets from high speed airplanes, but if skillfully handled and fought, the air-

ship would stand a better chance of getting its information back to its fleet, and do it in quicker time, than would any destroyer or light cruiser dispatched on the same scouting mission and attacked as it would be by the same airplanes augmented by torpedo and bombing planes, gunfire, torpedoes and with probably an added mine hazard. When and if helium is used, airships will by no means be easily destroyed weapons. They already carry a considerable sting in the form of numbers of machine guns, and the questions of their further defensive armament and tactics in the presence of high performance airplanes or enemy airships have scarcely been touched. The naval use of rigids in the war was a one-sided affair, and airplane performance and attack did not become so serious but that it could be taken care of by improvement in the airship's ceiling and performance. The old adage "set a thief to catch a thief" may have its application here for the British have already proved that an airplane can be carried on and released from a rigid airship.

For short distance scouting heavier-than-air craft will doubtless prove the more useful and are certainly cheaper, but airships will be indispensable for carrying large loads and for flights beyond the endurance of the airplanes. The rigid is essentially a long distance, weight-carrying craft. Its principal naval function is long distance, or long endurance, reconnaissance. Other uses are: coastal patrol; long distance convoy work; anti-submarine operations; mine searching; bombing enemy fleets or bases; maintaining communications with detached expeditionary forces, providing supplies in small quantities, etc. At present their significance to our own fleet is potential only. The extent to which this potentiality can be turned into an actuality depends on time, and the energy, imagination, and skill with which their development is pushed.

SOURCES

Neumann: "The German Air Force in the Great War."

Whale: "British Airships, Past, Present and Future."

Pratt: "Commercial Airships."

Cole, A. P.: "The Principles of Rigid Airship Construction." Royal Aeronautical Society, 1920.

Pritchard, J. E. M.: "Airships and Their Development." Royal Aeronautical Society, 1920.

Campbell: "The Effect of Size Upon Performance of Rigid Airships." Institution of Naval Architects, 1920.

[Various magazine articles in German and British Press.]

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NAVAL OFFICER AND THE CIVILIAN

By PROFESSOR WILLIAM O. STEVENS, Department of English, U. S. Naval Academy

In the days when government was in the hands of kings or an upper class, it made no difference whether a people knew anything about its army or navy. Wars were declared by those in authority to suit themselves, and the professional fighter did the work. The rank and file could be conscripted or impressed, and these poor wretches, who had no idea what the war was about, had no alternative but submission. The rest of the people, except for paying taxes, went about their occupations. It is interesting, for example, to note how little the city of London, with its trades and handicrafts, was affected by the long drawn wars of the roses. Whether white won or red made no difference to the plain citizen of London; with him it was "business as usual."

In our own day, however, kings and upper classes have little to say worth listening to. What has always been true of our republic is getting to be true of the world. Wars will be declared hereafter by the chosen representatives of the people. Moreover, wars are no longer a matter of a professional class, they are fought by whole nations. Indeed, the distinction between combatant and non-combatant was practically wiped out in the World War. The professional is the leader and drill master, but he must depend on wholesale popular levies for the actual fighting force. This is too obvious perhaps for comment, but it has its implications which do not seem to be so clearly recognized.

Let us suppose the army and the navy to be two members of a team for national defence. It follows that the third member of this team is the people. Further—and this is too often ignored—this third member of the team is also its captain. It lies with the

people to determine the size of army and navy, to say whether army and navy shall act, or indeed whether there shall be any army and navy. Obviously if the team is to succeed there must be team play and team spirit. Do we have these essentials developed to the proper degree? It not, what are the things in the way, and what may be done about it?

Of course the answers to these questions affect the army as well as the navy, but I shall confine this discussion to the naval aspect as suggested in the title offered by the Board of the Naval Institute —"The Naval Officer and the Civilian." I venture to hope that a connection of nearly a score of years with the navy may be of service in explaining to the naval officer civilian points of view which must seem baffling and exasperating, and in suggesting means of creating that *entente* between our first line of defence and the people which any man who believes in the navy must desire to see attained.

I. SOURCES OF FRICTION

No one need pretend that relations are ideal now. There are apparently sources of misunderstanding which do the navy harm. In the first place nothing, I suppose, strikes an officer as so absurd, so maddening, as the charge that naval officers are "snobs." And yet we cannot shut our eyes to the fact that there is a strong undercurrent of feeling to this effect which has been running ever since the navy was founded. Last fall, for instance, *The Baltimore Sun* said editorially that the Naval Academy "bred more snobs than any other school in the country." If that is the way people feel, our team spirit can certainly be improved. And as far as that idea is reflected in Congress it is going to hurt the navy every time it appeals for the support it needs. What is at the bottom of this snobbery idea and what can be done to get rid of it?

Not long ago this question was discussed by an officer in the pages of the U. S. NAVAL INSTITUTE PROCEEDINGS, and as I recall it his conclusions were that the fault lay with the civilians and that the only remedy was to have universal conscription, through which civilians would gain the habit of saluting officers. That reasoning is hardly calculated to make a hit with the civilian public. Why not approach the subject by admitting that there must be some fire that has kept this harmful idea smoldering a hundred years and look for it with the idea of putting it out?

The earliest reason lay in the fact that when our republican navy was first organized every other navy in the world was composed exclusively of the members of the aristocracy. It is true that occasionally in the British Navy a commoner like Benbow or James Cook won commissions by sheer merit—but the fate of Benbow and the niggardly recognition of Cook's great achievements are suggestive of the difficulties such men had. Our democratic country did not relish an artificial aristocracy in its army and navy, kept a jealous eye on its servants from the beginning, and did not like it when our officers imitated too closely the ways and manners of the British. But as a matter of fact, people don't expect an officer to mess with the enlisted men any more than they would expect a superintendent of a mill to lunch with his operatives. The civilian inclines to the view, nevertheless, that the heavens wouldn't fall if either should happen to do so for a good reason. But this aspect amounts to little to-day in view of the almost unlimited opportunity offered for advancement to any enlisted man who can make good.

Civilians regard the naval officer as a public servant; they are at bottom exceedingly proud of him, though they don't often betray the fact, but they are quick to resent anything on his part that smacks of caste or "class consciousness." Any civilian may say things which will be promptly resented when uttered by someone in the service. For example, I once overheard a captain's wife in a party of naval officers on a train remark loudly and sneeringly, "Oh, I suppose anything can happen in this American *democracy* of ours!" A business man in the same seat with me—who had entertained scores of naval officers in his own house—turned to me and said angrily: "Did you hear that? Damn these naval officers, they make me sick!" It was a trivial thing to get excited about, and if the remark had come from someone not identified with the service my neighbor would probably have not noticed it, but there it is. That is just the kind of thing, repeated here and there, which helps to keep the old charge of snobbery alive. The moral seems to be that the uniform marks the officer from the rest of his countrymen and the unfortunate trifle in word or act of an individual reacts upon the whole service. If you must get out of patience with democratic institutions and damn the "Peepul," do it far from the civilian ear!

But this vague charge of snobbery does not rest only on the idea of a social caste. Many civilians hold that the officer thinks of the

navy first and of his country second, or perhaps that he regards the service as a close corporation, organized for the benefit of its members. This is not true, of course, but some things have happened that give color to the idea. For example, the classes of reserve officers that came to the Academy during the war were officially welcome, but unofficially treated to an amazing amount of riducule and hostility. One would have thought that these young men who had left their college or their profession to serve in the navy were interlopers or trespassers. The midshipmen particularly, though excused from saluting these reserve officers in the yard, were outraged; indeed their chief worry in the war seemed to be not whether we should be able to beat the Germans but whether these reserves were going to stand in the way of promotion.

Naturally these amateur officers could heardly be expected to compete successfully at all points with the Naval Academy graduate, but the navy had to have them and they came with the best intentions in the world. Moreover, Admiral Sims pays them a high compliment for their service in the war. Indeed, he even suggested that the Naval Academy be transformed into a graduate technical school for college men.

Now many of these reserve officers had a sense of humor, and most of them got to sea, where in the wholesome atmosphere of a man-of-war they forgot the annoyances of Annapolis. They returned, as far as my experience goes, full of enthusiasm for their respective skippers and for the navy in general. Others who did not have this sea experience before the armistice went home sarcastic over the "snobbery" of the navy. One of them wrote a long article for a leading southern paper describing his experiences. This was sent by the editor to a civilian at Annapolis for comment. "If this is true," wrote the editor, "I'll see that this is printed broadcast all over the south at least." The civilian succeeded with difficulty in preventing its publication. The young man, by the way, had had every advantage of wealth and education. While traveling toward Annapolis in a glow of patriotism to join the navy, he scraped acquaintance with a naval officer. The latter was plainly disgruntled. He explained that he was assigned "the worst duty in the navy—teaching those damned reserves." He went on to tell at length how worthless they were and concluded by saying he could "tell one a mile off." That was the young fellow's introduction to

the navy, and the rest of the story was in keeping with that introduction. Now wherever he goes and as long as he lives, he will be a bad advertising agent for the navy. And he was not alone, as I happen to know. In short there may be an overgrown *esprit de corps* which contributes directly to this charge of snobbery.

In passing, while this has no relation to the question of "snobbery," it may be remarked that both army and navy seem at times to develop their respective *esprits de corps* to the point that makes smooth co-operation for the nation's benefit impossible. Our history is not notable for the teamwork of the two services. And the recent discussion, for instance, between the Army Air Service and the Navy Department has not been remarkable for the show of team spirit. We have at last a joint Army and Navy Board, but a certain army officer of high rank—who has himself been present at the meetings—informed me that it was a failure because the representatives of the two services were more concerned in keeping each other from gaining any advantage than in accomplishing their common purpose!

The second source of friction is the charge that the naval officer is a militarist—a "Prussian." This is probably even more exasperating than the charge of snobbery. Of course a naval man believes in militarism of a certain sort. But no American officer of the army or navy has ever tried to play the man on horseback with the nation's liberties. This fact is generally recognized, and many of our military men have been elevated to the highest elective office in the land. The feeling comes down to something like this, that the officer is always urging a larger armament because it magnifies his profession rather than because the situation demands it. In much of the talk about increased armaments, it must be admitted that the champions of increase have not reckoned enough with the popular demand for reduction to the point of safety, and have done little to make clear to the American people just why the increase is needed.

The civilian says that Japan is our one war cloud but that we ought to be able to establish an understanding with the British Empire that would cool off even the Junkers of Tokio. Before the war, he says, we were told that our navy should be second to England's; we have that at the present time. But now we are informed we must have a navy equal to England's, and a rear

admiral has recently declared in public that we must have a navy equal to England's and Japan's combined! The civilian argues, therefore, that you can't trust the naval officer's opinion. He will always demand a bigger navy on principle—the principle that promises quicker promotion. To build a navy equal to England's the civilian thinks is the surest way of making trouble with a nation whose existence depends on maintaining a margin of sea power. Germany tried it and committed suicide. As to a two-power standard, he dismisses it as sheer lunacy. Hence, when the naval officer sounds the cry of "wolf, wolf!" in an hour of real danger, he may find it hard to get a hearing from his fellow countrymen.

It may be added too that it does not pay for an officer in writing for a civilian public to sing the "benefits of war." It will pay no better to sneer at the American people because they are "peace-loving"—even Mahan did that. Nor will it do much good to harp on the need of universal military service. It seems as if naval officers in writing for the public too often hit these notes, which are precisely the ones least calculated to wake an echo in the civilian mind. They strengthen the suspicion of "militarism." Let there be more talk about preparedness that reasons from actual necessity, that recognizes the curse of great armaments, and that aims to prevent war.

The third and chief cause of friction is not a charge against the navy; it is sheer ignorance. Sometimes the officer fails to understand the civilian view point, more often the civilian knows nothing about the navy. This is the fundamental trouble. Much of the feeling expressed in the charges of "snobbery" and "militarism" arises from nothing but ignorance. The civilian does not realize, for example, that naval officers are so cut off from their countrymen, by the very nature of their calling, that they find common interests in each other rather than in outsiders. Hence, what is called "clique spirit" is not a fancied superiority to civilians but the inevitable consequence of naval life.

I have come across people, too, who have the idea that naval officers live in luxury and idleness at government expense. They think that uniforms and mess bills are paid for by the public, that officers have nothing to do but stalk about and damn their subordinates. In short their idea of a naval career is a succession of luxurious yachting cruises, furnished for certain lucky individuals at the taxpayers' expense. Probably the chief reason some people

steal cigars, silver, and epaulets at a public reception aboard ship is that, according to their lights, everything on board is paid for out of the common taxes, and they might as well help themselves to souvenirs. Of course this extreme opinion is not held by anybody who knows anything about the navy, but the trouble is that there are too many people who do not know anything about it. This is a fact that the navy needs to take into account. This is the fundamental trouble in the relation between the navy and the civilian.

II. EDUCATE OUR MASTERS

Nothing has been said so far about the officers' complaint against the civilian public. The civilian has always been blind to the needs of preparedness, he has had the most absurd misconceptions of military and naval problems, he has never appreciated discipline, he has never understood the military ideal in character. It is the civilian who must bear much of the blame of the ghastly failures of our war of 1812, the prolonging of the Civil War, the delay in getting into action in our late war. All this is true. But the trouble is that the civilian is the boss, and you cannot kick your boss, no matter how stupid and how slack he may be. When the suffrage was extended to the poorer classes in England a half century ago, one of the tories who had fought the measure exclaimed mournfully, "Well, we must now educate our masters!" This is the second step in creating an *entente* between the navy and the people. We cannot kick the boss but we can educate him.

The naïveté of the civilian public regarding naval and military matters is well illustrated by an observation by the late Henry George in his *Social Progress*. The substance of the passage is this: "The United States should abolish army and navy, because we are so powerful a country that no other nation would dare to attack us, and for the same reason we should be ashamed to attack any other." No one can deny that Henry George possessed an original mind capable of acute thinking, and if he could write like that, what of the rest of his countrymen? It is safe to wager that at least a million voters to-day would wag their heads over that precious piece of reasoning and declare that it was just about right.

Ferrero, the brilliant Italian historian, recently published an article in which he proved that the Americans had abandoned the League of Nations because the freedom of the seas was the one

thing they wanted in the World War and it was lost in the shuffle at Versailles. It is a very pretty theory indeed; the only trouble with it is that it is not true. Not one American in ten thousand has any idea what "freedom of the seas" means. The Americans are not conscious of the sea at all. In England, on the other hand, everybody is conscious of the sea; the man in the street does not have to be told what sea power means to the British Empire, and the navy does not have to counteract a public indifference.

The contrast is brought out by the fact that in this country we have to depend almost entirely on the American branch of an English house to get any naval books at all. And the American branch—the George H. Doran Company—finds it hard to sell in the United States half the number of copies that the home office (Stodder and Houghton) can sell to the British public.

Moreover, the usual post war revulsion from everything military tends to make it more difficult than ever to rouse popular interest in the navy. Magazines refuse articles or stories with even a brass button in them. Last year it took four entrance examinations and a newly created certificate to fill the entering class at the Naval Academy to anything like its normal size. Clearly, for the sake of both the navy and the nation, the public needs education. But who is to supply it?

In the Spanish American war the country made itself ridiculous by the howl of the Atlantic seaboard for naval protection against Cervera's fleet. Congress bowed to the storm. and our strategy was upset. Schley's "Flying Squadron" was held at Hampton Roads instead of operating off Cienfuegos. It was at that time that two eminent statesmen from Portland, Maine, wrung from the President a pledge that he would send a man-of-war to protect the old home town. Roosevelt, who received the order, chuckled over it and dispatched a Civil War monitor with twenty-one New Jersey naval militia aboard. But Portland was satisfied and felt safe!

The whole episode was ridiculous but perfectly natural. What naval officer had ever taken the trouble to tell his civilian countrymen anything about the elementary problems of war? In commenting on this episode Mahan wrote feelingly, "Whatever really enlightens public opinion in a country like ours *facilitates military operations.*" In short, the more enlightenment you spread the better for your military operations. To establish a better rela-

tion, then, between the navy and the civilian, it is necessary to have a campaign, or at least a policy, of public enlightenment. The first step is to encourage officers to write and speak for the public.

In the past it has been considered bad form, not to say officially improper, for officers to contribute to papers and magazines. Mahan himself was once curtly informed by the Department that it was not a naval officer's business to write. Nevertheless, he performed a great service by writing not only his erudite works which comparatively few would read but also by contributing articles to popular magazines—even to a boy's magazine. Of this service President Roosevelt wrote: "In dealing with our naval officers . . . . Mahan was merely one among a number of first-class men. . . . . But in the vitally important task of convincing the masters of all of us—the people as a whole—of the importance of naval needs, Mahan stood alone. There was no one else in his class or anywhere near it."

Admiral Sims remarked recently that if he was alive and able to speak when the next war came he would go on the Chatauqua circuit. Why wait till the next war, when it may be too late? The British Navy has prided itself on the name "Silent Service," but since the war almost every admiral has either written a book or an article for the *Times*, or both, usually with the idea of setting himself right with the public. Why should not officers be encouraged in peace times to discuss some of the matters dear to their profession with those who have their destiny in their hands—the people—and do so before post mortem explanations and apologies are called for? Why should all such discussion be expected to come from outsiders who cannot begin to have either the knowledge or the interest?

Of course criticism of the administration can hardly be encouraged, but let us have as much free speech for naval officers here as they have in England. Suppose an officer does give vent to a fool idea, it won't do any harm. He will get some wholesome criticism, you may be sure, either from the newspapers or his colleagues, or both. Better that, than having him rise to a post of responsibility with that fool idea set like granite in his head. At all events we should never see again the spectacle of 1914, when Admiral Mahan himself was muzzled by executive order for fear he might hurt someone's feelings in Berlin or reveal perhaps our

own unreadiness for war, or that of 1916 when Admiral Fiske was forbidden to say "even that two and two make four." Why should the naval officer be quarantined from the rest of his countrymen? And how can you blame the civilian public for not knowing essential things about their first line of defence if naval men are not encouraged or permitted to tell them about it? There is no Mahan for this generation of Americans.

A case in point is our situation relative to the Philippines. An American naval officer wrote the following to an English friend:

> The Philippines are there for Japan whenever she likes to take them, and nothing can prevent her from seizing them when she feels disposed to do so. As at present circumstanced, we could do nothing whatever to protect them in time of war. If we were foolish enough to locate a fleet at Manila the history of Port Arthur would repeat itself, with us in the rôle of the Russians. An expeditionary force . . . . could leave the southern ports of Japan, reach Manila in three days, and make itself absolute master of Luzon before succor could arrive from Hawaii, our nearest naval base, which is some 5000 miles away. Consequently, when the "rescuing fleet" did turn up, it would find the Japanese flag waving over Manila, and itself, with depleted bunkers, forced to fight under the most disadvantageous conditions or to beat an ignominious retreat without standing on the order of its going. That is not merely a picture of what might happen, but of what most assuredly will happen if war breaks out within the next few years.[1]

No brother officer is likely to deny the truth of that picture, but how many civilians, how many Congressmen especially, realize that it is true? To most people the fact that we have more dreadnoughts than Japan is a comfortable guarantee of victory in a conflict of sea power. But, after all, how can they be expected to know better unless the naval officer, instead of addressing only his brother officers or writing to service friends in England, finds a way of carrying the message to his countrymen? Does one American in a hundred thousand realize the importance of making Guam a fortified base, and if not who is to blame?

When an officer sets out to teach, like every other person who begins to teach, he will learn also. He will learn the civilian point of view as to war and armaments and treat it with respect, he will be careful to make his readers or hearers feel that he thinks of the navy as a servant of the nation, he will remember that it is possible for a lieutenant to be right and a rear admiral wrong, and he will

[1] Quoted by Hector C. Bywater, *Sea Power in the Pacific*, p. 256.

remember that not everything that is time-honored is sacred. The military mind has not been famous for its welcome to new ideas. Never a change has come, from the introduction of gunpowder to the founding of the War College, that was not fought by nine-tenths of the officers at the time. At the same time he will find it not difficult to make any audience—that is not Bolshevik—realize that a nation needs an adequate navy for the same reason that a city needs an adequate fire department and police force—anyone can grasp that. He can readily show the need of the most modern equipment and a full and well-trained personnel. He can make clear also what the navy's functions are in war with relation to our national defence. Finally, he can make the civilian realize that the military ideal in character is too fine a thing to be monopolized by the military man.

That introduces a second feature of this education policy—morale. It is not enough that people are able to perceive naval needs and problems of national defence; they must have the proper spirit. This third member of the team for national defence must not only know the plays, so to speak, but he must have the stamina, the fighting spirit. This does not mean the bellicose spirit; it means the belief in certain impalpable things that the people hold so dear that they are willing to fight to the death for them. And as history has shown, this spirit is not in the least incompatible with what Mahan called a "peace loving" nation.

National morale depends on what a nation believes in. This is a factor of enormous military significance. It is perhaps hard for a military man to realize that the most terrible force in history is an idea. It is terrible because it mocks at armies and navies; uses and disdains them at pleasure. It can conquer with the sword, as Islam swept over Europe in the armies of the Saracen and later of the Turk. It can conquer without the sword, as Christianity triumphed over Rome. It can make an army unconquerable, as the Ironsides of Cromwell or the motley soldiers of France in 1793. It can ruin an army, as the Russian of 1917, or a navy, as the German of 1918; and it is curious to see how the same Russian army that collapsed in 1917 became formidable in its devotion to Bolshevism. Napoleon paid tribute to the power of the idea when he said, "the world is ruled by imagination."

Now an idea may collapse of its own emptiness but it can be beaten only by another idea. It cannot be shut out by any *cordon*

sanitaire, and it can spread faster than a prairie fire in these days of rapid communication. A nation that succumbs to a demoralizing idea suffers worse than from an enemy conquest, and the latter is sure to follow as a consequence. If this country yields to the fashionable ideas about "self expression," "class consciousness," "class warfare," "peace at any price," it will fail utterly as a fighting machine, and in its failure it will drag down army and navy with it. It would seem therefore that the naval officer might well be interested in trying to preserve the older and stiffer ideals on which this country was built—in the best sense the soldierly ideals comprised in that splendid word "service." Who can do this as well as the man who has been brought up to that tradition, and who bears that word as the title of his profession?

III. METHODS

How then shall we go about this policy of getting the people and the navy into closer teamwork? We will avoid the term "propaganda" because it is still rank with the smells of the war. We might say our motto is to "sell" the navy to the American people, but that has a commercial sound for something much finer than a trade or a deal. But whatever we call it, it must be a campaign thought out and organized by experts. The suggestions given here are merely hints of the methods that might be followed.

In the first place I venture to urge that the activities of the present Morale Division be extended to cover not only the morale of the navy but the "navy-morale" of the country. This should not shut out the work of individuals—we don't want another Creel Bureau—but the general campaign should be in the hands of the Morale Division.

The prime consideration is the objectives. There is a large section of the country, the Middle West—with which may be lumped a part of the South—which, being far from the coasts, is likely to be lukewarm about the navy. In the past the people of this agricultural section have been sneeringly dismissed as "wild-eyed Populists" or "Hicks." But they have not been all fools, nor have all the "fool ideas" they have stood for been entirely foolish. What in 1896 were "outrageous attacks on the Constitution"—like the popular election of Senators—are a matter of course in 1921. Moreover, this section of voters has the whip hand

in our elections and it is exceedingly independent in its voting. It is important then that the navy reach inland to those people and preach navy doctrine. These people never see a naval officer or a bluejacket, to say nothing of a battleship; they have no districts that fatten on federal appropriations for navy yards. They know that they are perfectly safe from the shells of an enemy fleet. Every circumstance tends to make them indifferent to their navy. Let the Morale Division, then, plan a campaign to conquer this region for the navy. Let the navy capture "Gopher Prairie"! It is a strategic point.

Further, in the last year women have become voters the country over. What interest have women in a navy? How many women understand the need of an adequate navy, and how many take any interest in it whatever? Yet these women have a tremendous power in electing the governments that can make or unmake the navy. Let the Morale Division plan a campaign also to interest the woman voter.

Lastly, there is the most fertile field of all—the voter of to-morrow, particularly the boy. Here is someone easy to convert, and to fill with enthusiasm that will last him a life time. Get the boy of to-day and you insure the navy of the future.

Now what are the avenues of approach for these objectives? Obviously one is the printed page. It ought to be easy to prepare readable articles or "stories"—fully illustrated in most cases—for every type of publication that reaches the people. Naval anecdotes, new wrinkles in naval development, facts regarding the present superiority of other navies in matériel needed by our own, the relation between our navy and our international problems—all such matters can be treated in ways adapted to publications as diverse as the *Atlantic*, *Saturday Evening Post*, the *National Geographic* and the *American Boy*. As for women's magazines, why has nobody ever written an article on a subject like "Housekeeping Aboard a Battleship"? Nor should the humble country weekly be forgotten. One way of reaching country districts is through these home papers. This is easy. Prepare what is known as "patent filler" or "boiler plate," a section of matter electrotyped and ready to fit into the page. Editors will be glad to get it, especially if it doesn't cost them anything.

It is hard to over-emphasize the value of the boy's magazines. I remember being thrilled about thirty years ago by an article in

St. Nicholas on the Naval Academy. What had been merely a name became thereafter something of absorbing interest. But nothing on the subject, as far as I know, has ever appeared in *St. Nicholas* since. My early enthusiasm for naval heroes was largely due to Molly Elliott Seawell and her serial, in the same magazine, on Decatur and Somers. But Mrs. Seawell is gone. The point is that you can get the boys of this generation and the voters of the near future through the boy's magazines. But why wait for some enthusiastic civilian to write the navy stuff, hoping that somebody will turn up; why not prepare and plan this material in Washington and have it published by co-operation with the editors?

Another means, of course, is the "movies." The short "educational" and news films are popular, and they spread a vast amount of information. Why not see to it that there is plenty of interesting naval information ready for the producers? Here is an easy way of showing your corn-fed voter in Iowa what our fleet looks like, how our men live and work, study and play, and at the same time sandwich in the ideas of what the navy is for.

Then there is the method by speech. There are countless occasions where an officer who can speak well and who has an attractive personality can appear and give navy talk. Rotary Club meetings, conventions of all sorts, Y. M. C. A.'s, Chamber of Commerce functions, patriotic occasions, where a naval man—if he can speak well—would be welcome, and where he could do a great deal to bring about the team spirit between navy and people. Ideal occasions are Boy Scout and Girl Scout conventions. Not one should be allowed to occur without being "planted" by a navy speaker. And there are Boys' Clubs; for example, a flourishing one on the East Side in New York. This club has distinguished men as speakers from time to time. Why not a naval man too? Nor should the schools be forgotten. The Erasmus High School of Brooklyn has, I am told, about five thousand boys. Suppose Lieutenant Isaacs, for example, were detailed to tell those boys of his experiences in the war. You would have five thousand boy "rooters" for the navy now and five thousand voters for the navy in five years.

Many other things might be done. For instance, suppose each graduating class at the Academy were asked to contribute a definite

number of their "Lucky Bags," and these were presented to the libraries of picked schools. The boys would devour them, and they would make the finest imaginable advertising for the Naval Academy. Again suppose medals and other prizes were awarded annually for essays on naval subjects in schools of various districts, and books about the navy were awarded to the schools represented by the best upper twenty-five or fifty of the essays. Indeed, one could multiply such suggestions indefinitely, but these are surely enough to indicate the lines that might be followed.

Much can be accomplished for the navy if there is a deliberate campaign directed from the Morale Division. Does all this sound fanciful? The idea of a Morale Division in itself would have been thought fanciful ten years ago. Let us not forget Mahan's saying that "whatever really enlightens public opinion in a country like ours facilitates military operations." Mahan is gone—and there is no individual to fill his place—but the process of creating enlightenment and arousing interest ought to be taken up and carried on. How else can we create a national interest in the navy, an understanding of the relation between national policy and the navy; how else to a loosefooted people like ourselves can we make clear the value of discipline—self discipline, the devotion to the ideal expressed in the word "Service"? How else can we make the civilian realize the fine inspiration in the military ideal of character? Knowledge and morale cannot be trusted to happen somehow; they must be deliberately created. If we do create them, they will react on Congress and through Congress on the navy. Then we shall have fulfilled its greatest need by establishing a team spirit between the navy and the people.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

YAP

By COMMANDER B. C. ALLEN, U. S. Navy

Within the past two years the question of mandates in general has changed Yap from a possible subject for a comic opera to a probable cause for international dispute. A great deal of information, largely of the mis-variety, has been published recently, but some points of possible interest remain to be told by one who is fortunate enough to have been there when the laying of the Guam-Yap-Menado Cable put Yap on the chart, in 1905. Perhaps many changes have been effected since that time, but as it was not the German nature to improve the islands or the natives, it is probable that Yap to-day is about as it was then.

In the PROCEEDINGS for November, 1920, Lieut. Commander Luckel shows that there are only two cables in the Pacific, as compared to twenty-two in the Atlantic, and that the British Vancouver-Australia Cable does not furnish direct communication with the Orient. This leaves, to carry all of our traffic, but one cable, the San Francisco-Honolulu-Midway-Guam-Manila-Hongkong Cable and its two branches, Guam-Japan and Guam-Yap-Shanghai, both owned by Japan.

With Japan, our business competitor, in control of the direct cables to Japan and China, our communications would be subject to delay, interference and tampering. True, we have radio communication, but radio can be read by all and codes can readily be broken. It is evident that our commercial success in the Pacific demands that no other country have control of the cables.

Yap, which under German ownership, was the capital of the Western group of the Caroline Islands, Ponape being the capital of the Eastern group, is in Latitude 9° 30′ N., Longitude 138° E., or about 500 miles southwest of Guam and 1400 miles from the

Philippines, therefore flanking the Guam-Manila line, and the Samoa-Manila line as well as forming a base for operation against Guam.

While the island probably is not fertile enough to supply food other than cocoanuts, hence would not be self-supporting. It has an excellent harbor in Tomil Haven, capable of considerable enlargement. Reference to the chart (Fig. 1) will show its size and narrow, easily protected entrance. A diagram of a 750-foot ship, drawn to scale, shows that although there are very few possible anchorages with sufficient room to swing, many ships

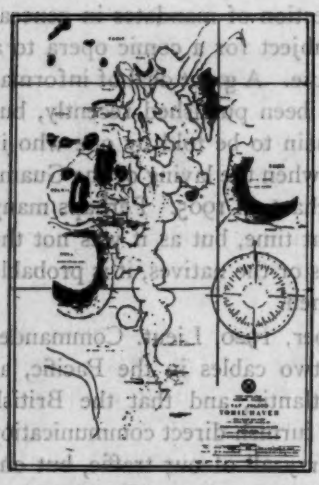


FIG. 1.

FIG. 2.

could be moored bow and stern, making an excellent base for a raiding force.

The island is about 12 miles in length with an average width of 6 miles. Tomil Haven being long and narrow, extends into its center so that indirect fire might be used against it from almost any direction (Fig. 2). The highest point is about 1000 feet, the hill being just back of Tomil Haven and affording an excellent site for fortifications. A canal connects Tomil Haven with the inlets to the northeast and northwest. This was cut through the Mangrove Swamps in about a year by 800 natives, and in 1905, was difficultly navigable by a navy cutter, being intended only for

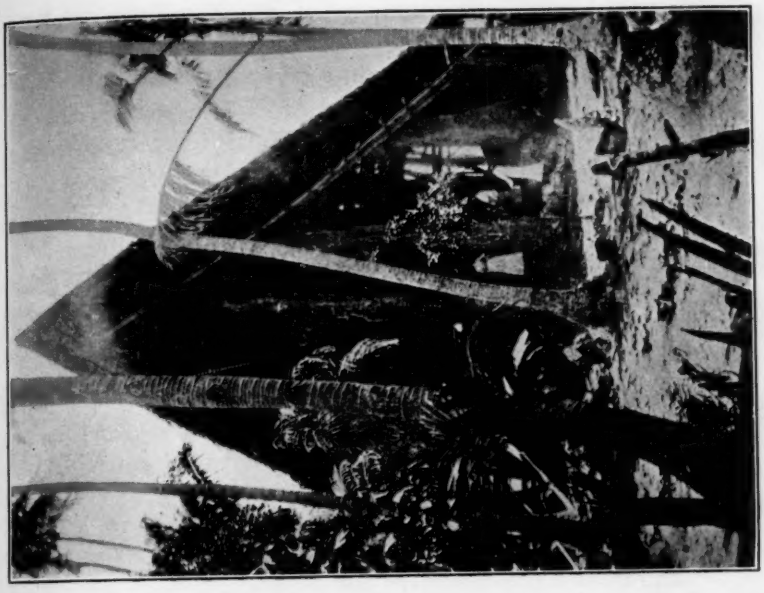


FIG. 4.—Bachelor Hut.

FIG. 3.—A Lady of Yap.

native canoes. It could be readily enlarged so as to accommodate destroyers, at least.

The natives of Yap number about 7000 and are called "Micronesians" or "Caroline Islanders." Their tribal instinct is strong and they do not readily mix with other peoples. They are somewhat migratory and are bold navigators. About 20 years ago a colony of them settled in Guam, where they were extensively photographed, the resultant picture postals being sold by the enterprising Japanese merchants as showing the natives of Guam. This colony was banished in a short time, being undesirable in many ways, and, in 1905 was still intact as such on Saipan, another of the Marianas. Five or six Caroline Islanders made the trip from Yap or Ruk to Guam, in a small outrigger canoe in 1905, but were wrecked in landing through the surf. They had subsisted for about two weeks on bread-fruit and rain water.

The men are rather taller and more slender than the Samoan or the "Chamorro" of the Marianas and the women smaller (Fig. 3). A feudal system was said to exist, the serfs belonging to the owner of the land upon which they lived and transferring with the land. The freeman was distinguished by the wearing of a comb in the long hair he wore like the tail of a comet, the serf being without the comb. The female serf could become free by marriage with a freeman, but the male serf could not become free. The serfs lived in villages by themselves.

Yap has been one step ahead of the so-called civilized world in the marriage system, in that they have trial marriage and find out incompatibility before and not after taking. Large "bachelor huts" are built, some of them 50 feet in height, as can be seen in the photograph (Fig. 4) by comparison with the height of the woman in the foreground. These are entirely of wood, nipa, etc., and have no nails in them. In fact in 1905 the natives still used stone tools almost entirely.

The huts of the well-to-do are sometimes fenced in by fences of stone money which is even used to pave the "yard" in front of the hut or left at the water's edge in front of a hut, as can be seen in the photograph (Fig. 5). No tale of Yap or of stone money is complete without the history of "King O'Keefe," trader and able financier. O'Keefe was, somewhat like Bully Hayes, a trader who ran a schooner from island to island collecting copra, "bêche de mer" (dried sea slugs much appreciated by the Chi-

FIG. 5.—A Yap Canoe and Some Stone Money.

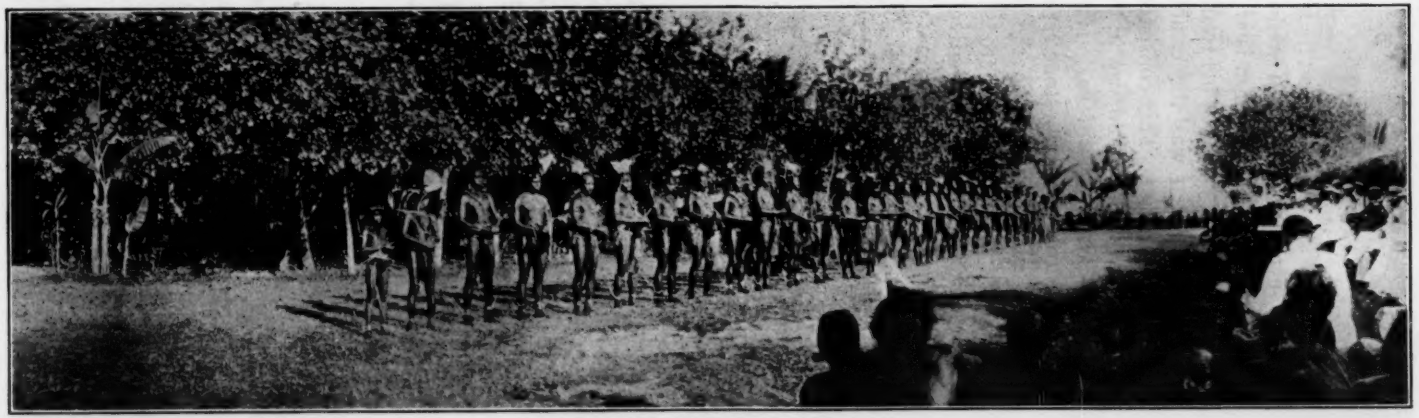


FIG. 6.—A War Dance.

nese), etc. It is said that he started his rise to affluence by marrying several daughters of well-to-do chiefs on various islands, and part at least, of the tale is true, for several of his widows lived together for years, at his trading station at Port Tomil, in amity. The next step was the establishment of a mint near his main trading station. This consisted of a stone quarry made "taboo," so no one else could use it, from which O'Keefe had cut large stone cart wheels of various sizes, the basis of the system being the cocoanut and the stone representing for each span of the hand, 1000 cocoanuts. When the native delivered cocoanuts he was paid in trade stuff or in stone money, but stone money bought no trade stuff, also as the native male wore only a jockstrap and a comb and the female a grass skirt like a haystack and a hibiscus, they needed little trade stuff (Fig. 6). O'Keefe was a great financier. It is evident that no police force was necessary to protect the money fences.

On one occasion about 20 "buck" natives came on board the *Supply,* which had been especially equipped for the Governor of Guam, and filed into the "reception room" which contained several large fans controlled from a pear push switch. These fans were started without warning, but although some of the men nearly lost their back hair they showed no sign of astonishment, except a slight flinching, nor did the stopping of the fans or the snapping on and off of the lights, break their stoicism. They had never seen such marvels before. Small cakes were passed to them and following the example of their hosts, each took one and put it in his mouth. They soon made a dignified exit and walked aft until out of sight of the Governor's quarters, then spat the cakes over the side. Such innate gentility in a naked savage was unexpected to say the least.

It is probable that the natives have some useful occupation other than chewing betel-nut sprinkled with lime and waiting for the cocoanuts to drop off the trees, but no such was in evidence. The German governor and his one assistant had created a fine state of discipline as was shown by the fact that only one native was seen by the officers of the *Supply* until after the Governor had approved them when the natives flocked around. Shortly before the *Supply* left, a bandsman went crazy and deserted, going into the thickest part of the island. A word to the Governor brought the man back within two hours.

The German system of colonization did not contemplate any improvements for the land or the natives, and all taxes went toward the maintenance and comfort of the Governor.

The occasion of the trip of the *Supply* was the completion of the laying of the Guam-Yap leg of the cable and its readiness for use. The Germans, Dutch and Eurasians engaged in the cable work, gave a picnic, the *Supply's* share of the spread being ice. A native started up the hill with a cake of it on his shoulder, then dropped it saying that it burned him. However, it finally arrived and was used to chill something with more than 2½ per cent therein. The German chief engineer of the cable company was the busiest man present as he dashed through the crowd yelling "bier, bier!" seized a bottle, backed out, emptied it and repeated the process *ad infinitum*.

It is possible that some of the statements made as to customs are in error, if so they at least have the virtue of having been made by those on the spot.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ACROSS THE CONTINENT WITH AN INSANE MAN

By ADMIRAL R. E. COONTZ, U. S. Navy

In August, 1889, while an ensign in the service, I was attached to the U. S. S. *Pinta,* whose station was in Alaskan waters, but at the time in question the ship was at the Mare Island Navy Yard, for repairs. I had been away from home for several years and thought that during the stay of the ship at the navy yard, the time was opportune for a visit to my home in Hannibal, Mo. I well remember that I had accumulated the large sum of $242 which looked big to one who had saved it in Alaska on an ensign's pay of $109 a month. So I telegraphed Commodore John G. Walker, then Chief of the Bureau of Navigation, which bureau I had left, when ordered to sea, and requested a month's leave. I sat around with a packed trunk for four or five days awaiting a reply. One day during this wait and while at luncheon, Assistant Surgeon W. F. Arnold returned from a visit to the naval hospital and related the case of a man, who had twice escaped from the *Independence* while insane and had attempted to swim to Vallejo, and while on the second attempt had been picked up off the magazine wharf, about one mile south of the ship. He further stated that the commandant of the yard was anxious to get the man to St. Elizabeth's, Washington, D. C., the government asylum for the insane. About this time of day a telegram came from Commodore Walker granting me a month's leave providing it would not delay the preparations of the *Pinta* for sea.

I had made up my mind regarding the insane man as soon as I heard Dr. Arnold's story and went up at once to the commandant's office to interview Commodore A. E. K. Benham. This efficient and genial gentleman of the old school inquired my business and I told him I wanted to volunteer to take the insane fire-

man East. I had visions of a couple of enlisted men as guards to help me, of course, and was somewhat startled when the commodore asked me flatly whether I thought I could take the man alone. Being only 25 and green to the handling of insane people, I boldly answered "yes." "Very well," said the commodore, "I will make out your orders. You will start to-morrow night, will get the tickets in San Francisco and the man will be turned over to you at Port Costa Ferry."

About an hour later I received this order which is shown with all endorsements:

COMMANDANT'S OFFICE,
NAVY YARD, MARE ISLAND, CAL.
August 6, 1889.

SIR:

You will proceed to Washington, D. C., with Frederick Staade, 2d cl. fireman, an insane patient now at the naval hospital here, and deliver the said Staade to the officer in charge of the government hospital for the insane in that city.

Upon the completion of this duty, you will report to the navy department.

Respectfully,
Your Obt. Servt,
A. E. K. Benham,
Commandant.

Delivered Aug. 6, 1889,
A. C. Hodgson,
Lieut. Comdg.
Ensign Robt. E. Coontz, U. S. N.
U. S. S. *Pinta*,
Navy Yard, Mare Island, Cal.

NAVY DEPARTMENT
Approved
Aug. 13, 1889.
J. G. WALKER,
Acting Secretary
of the Navy.

NAVY PAY OFFICE
Washington, D. C., Aug. 13, 1889.
Paid $251.20 Mileage from
Mare Island, Cal.,
to Washington, D. C.
G. E. Thornton, Pay Director,
U. S. N.

NAVY DEPARTMENT
BUREAU OF NAVIGATION
1889, August 13.
Reported
J. G. Walker,
Chief of Bureau.

I was up early the next day and proceeded to San Francisco and with the assistance of A. Frank Gomez got a round trip ticket to Chicago and return leading back by Hannibal for $135, got Staade's transportation to Washington and fixed a section in the sleepers through and no change in depot at Chicago. I took the 6 p. m. overland out of San Francisco, feeling in good spirits with practically a free trip East assured.

Up to this time I had not seen the man. When the train slowed up at Port Costa I went out and met a couple of petty officers and Staade and they hustled him on board the sleeper in a hurry, placed one white clothes bag and one black one in the berth and then left me. The first question he asked me was, "Where is my thousand dollars?" To my amazement I realized that he had imbibed at least two drinks. His question rattled me for a second and then I unhesitatingly answered, "We are on the way to get it." He had on a white hat, a blue jumper and a pair of white working trousers. The sleeper was full of women and children and I promptly gave him my traveling cap and linen duster, the latter being worn by travellers at that period. He was a stout built fireman of 16 years' service, with a muscle on him that was appalling. Any visions I had of handcuffing him, if he got obstreperous, vanished when I saw that with one blow of the handcuffs he could smash my skull. In the section opposite me was an Australian lady, and her grown daughter, bound for England. She was watching us narrowly and about the time we got to Sacramento she leaned over to me and whispered, "Excuse me, young man, but isn't there something peculiar about your companion?" Tired and hot in that August night, I blurted out, "Yes, madame, he is crazy." "Oh!" she exclaimed, "you see this is my first trip through your country and I had read so much of the rough miners who had become wealthy and I thought perhaps this was a case and your companion was a rich miner and you were his son."

I couldn't answer this question, but I was reminded of the words of Lieut. David Peacock's famous song "For he looks just like a dog-house and much resembles me."

I had the porter put the cushions in the lower berth and some pillows there and turn the upper up with the idea that my friend would sleep there and I could arrange with the porter to sit up and doze in the smoking compartment. Staade refused, however, to go to bed in any such place and about 11 p. m. we both entered

the smoker and from then on until about 5 a. m. he told me the story of his life over and over again about 43 times. He had three ideas in his brain: First, that he was a Chinaman and his business was to dissect people, that is, he cut them up into the smallest parts possible after they were dead; second, that he had saved up money on a vessel on the South Pacific until he had $1989 on the books, but when the end of a certain quarter came they made him sign for $989 and somebody got the other thousand; third, that he had a saloon out on Georgia street in Vallejo and a wife and two children who lived over the saloon. Repeatedly and realistically he described this place to me, the rooms in the house, the personal appearance of his wife and children, until I began to think they must really exist.

I carefully explained to him that we would see the President and the Secretary of the Navy immediately upon our arrival in Washington.

The loss, or supposed loss, of the thousand dollars must have been the original cause of his insanity.

Somewhere about daylight I dozed off sitting upright and was rudely awakened about 6 a. m. by the conductor, who said, "Say, Mister, come and get that friend of yours. He has turned out all the people in the tourist sleeper and is giving them bits of paper and soap. I rushed in the tourist car and found he had carried his black bag in and had torn up some old German newspapers, sliced up a bar of salt water soap, and insisted on giving a piece of each to every passenger. On the plea of getting ready for breakfast I got him back in the proper sleeper, and about that time we stopped at Reno or Truckee for breakfast. We took a table and the waiter girl came up and asked him if he would have coffee. He answered, "Yes, sir." "Ham and eggs?" "Yes, sir." The girl got mad, but I smoothed it over by telling her that he had seldom met women and so said "sir" to everybody alike. When we finished breakfast and the conductor yelled "all board," Staade grabbed all the oranges, apples and bananas in the fruit dish on the table and started out. The result was the proprietor came over and I paid him a quarter for the extra fruit. After that meal I had a private talk with each eating house proprietor before we starting eating. We worried through that hot August day somehow and in the sleeper with me I found an army lieutenant named Ord traveling East with his wife and children. He kindly offered

to sit with Staade in the sleeper a few hours that evening while I slept in the smoking compartment. This was a fine chance as I was now nearly dead for sleep. About 9 o'clock, however, I was aroused by a succession of yells and on rushing in found that two of the Ord children had fallen out of the upper berth. The outboard one had seen her father talking to Staade and had leaned too far out and in falling had grabbed the inboard child and down both came. No bones were broken. Lieutenant Ord was game enough to amuse Staade until 1 a. m. Without that sleep I would have been desperate. We passed Ogden the next morning, changed sleepers and started on the 36-hour run for Omaha.

In a chair car they attached there Staade found a sympathetic friend and we sat there off and on until about 2 p. m., when we returned to the sleeper. As we passed the ladies' dressing room Staade made a break for it, got inside and locked the door. I took a seat near by, expecting he would soon come out, but he didn't and after an hour or so the conductor and porter tried to get him to open the door, but without avail. In the meantime we could hear him carrying on at a great rate and we began to get worried. About 5 p. m. he suddenly opened the door and came out. As he came up the aisle he exclaimed, "Well, that was the dirtiest, dustiest place I ever saw, so I cleaned it up." He had, there was no doubt of it. He had torn up his blue shirt and scrubbed the floor, windows and paintwork. The conductor demanded that we leave the car, but I showed him my orders and finally persuaded him that the road would have trouble with the government about it and he let us remain. By 11 o'clock that night I was dead for sleep and arranged with the porter that I was to pay him 50 cents an hour while he allowed Staade to talk to him. I sat down in the berth and was sound asleep in a second. About 2 a. m. I awoke and went into the smoking compartment and the porter was sound asleep and my insane man was gone. I aroused him and he admitted that Staade had talked him to sleep about 1 a. m. We got the conductor and brakemen and made a quick search of the train but failed to find him. The last stop had been Ogallala. Visions of a general court-martial for "neglect of duty in allowing an insane man in my charge to escape" came over me while I was getting my valise ready to leave the train and make a search for the missing man. About 3 a. m. we stopped at a cheerless station on the Platte River and I left the train. As I was about

to start up town I heard some excitement at the head of the train and the fireman came running down the platform yelling, "We have found him in the tender!" It transpired that he had slipped the porter at the last stop, gone down to the engine tender and got on board and sat there in the coal surveying the prairie scenery along the Platte River. Well, we got on board and I determined never to lose sight of him again, and I didn't. I stayed awake the next 60 hours. We got to Omaha that night, Chicago the next afternoon, and got on the Baltimore and Ohio limited train. When we finally rolled into Washington about 5 p. m., August 12, he insisted on going to the White House at once. I told him we must go to a good hotel and clean up first. I hadn't shaved since we started and wasn't letting him have any razors. Out on the sidewalk I hired a burly hack driver for five dollars, explained the situation to him and he bundled us inside and yelled "All aboard for the White House hotel." We drove across the river to St. Elizabeth's, entered the "hotel" and I got my receipt from the asylum authorities. Staade requested me to purchase him a necktie before we called on the President and the Secretary of the Navy and I went out to get the necktie and never returned. About 6 p. m. the hack driver landed me at Ebbitt House and I got a room and bath. I got out of the bath tub and sat down on the side of the bed for a minute and the next thing I heard was loud pounding on the door. It was 3 o'clock the next afternoon. Twenty-one hours had worried the hotel people. I determined next time to register from Antioch so they would think I was one of the seven sleepers and let me alone. I had slept without a stitch of clothes on, but being the month of August in Washington City, I didn't catch cold.

Well, I rushed up and reported at the department, drew my mileage, went to bed for eighteen hours again and then started for Missouri. I slept all the way out there in a dazed sort of way. My leave was shortened by telegraph and I returned to Mare Island early in September. As soon as I stood a tour of duty I took the first ferry for Vallejo and walked up Georgia street and down the hill looking on the starboard side for the man's saloon and his wife and his children. They were not there.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE STUDY OF HISTORY FOR NAVAL OFFICERS

By COMMANDER C. B. MAYO, U. S. Navy

There is nothing new under the sun.
History repeats itself.

THE SWIFTNESS OF MODERN WAR

Modern method of communication, swift concentration of crushing forces, make initial mistakes irreparable. The inherent difficulty of communication in the days before steam and radio, gave ample time for thought and study before the decision on which the fate of nations depended. The outcome of a campaign rested all too often on the forces of nature—there was an ever present feeling that, plan as they would, victory might come to the blunderer through the luck of weather or circumstance, and save from annihilation the slothful in preparation. Man has conquered nature; nature has taken her revenge. Woe to the luckless commander who has not prepared himself mentally, morally, physically for the strain and trial of modern war. The swift and merciless Mars of to-day metes out destruction to the laggard. He requires laborious hours of his devotees and upon his altar must be sacrificed comfort and ease and pleasure if we are to attain those attributes which alone can guarantee victory to our country's banners.

HISTORY REPEATS ITSELF

An officer aspiring to his full duty for his country; burning to excel in battle, must perfect himself in the rudiments of his profession in his early years and excel in the refinements thereof in later days. But this is not enough to command victory in the day of battle. The expert navigator, the bold and skillful seaman, the experienced engineer, the able tactician, all may well be

embodied in the person of the commander-in-chief of our fleets, but unless he be the possessor of a deep and thorough knowledge of the actions of great leaders in past wars, he is not fitted for his command. "History doth repeat itself," every situation of modern war finds its counterpart in past wars. "There is nothing new under the sun." A knowledge of what has gone before makes us prescient of the future. He who holds within his well-trained mind intimacy with the generals and admirals of the past wields a weapon of incalculable potential value.

MEANS OF ACQUIRING KNOWLEDGE AT HAND

Nor does the American naval officer have to turn far to find within his reach the means for acquiring this familiarity. Every cabin and every wardroom offers its inmates an excellent library of military history and biography. The department has done its part by placing within easy reach these books with their priceless lessons. It has done even more, for it employs an expert librarian who is ever ready and willing to advise us in our reading and to secure special books upon request. The War College has also selected a library and recommended certain books to be found on every large ship. There is, therefore, no excuse for a neglect of searching historical study by the young officers of the service. Such reading should not only impress history's lessons upon the formative mind, but will prove of value to that officer when our excellent War College opens its doors to him. How much the more benefit can be derived from a War College course if he understands the fundamentals upon which its teachings are founded! The time actually spent at the War College is of too short duration to allow exhaustive reading of *all* of history's lessons.

THE FASCINATION OF HISTORY'S STORY

The young officer who reaches this paragraph in this article (if any one *does* read it), will probably throw up his hands and remark that such a deep and important subject must, of necessity, be extremely dull and laborious. (Witness most of our studies at the U. S. N. A.) If the writer can claim his indulgence for a few more paragraphs *perhaps* he can be convinced that such is far from the case. Is the reader fond of adventure? What more

fascinating than the story of the Little Corporal, whose youthful genius, flaming out from the murk and chaos of the French Revolution, led ragged armies to victory at Castiglione; at Rivoli. What deed of our boyhood hero books equals the charge of the French Grenadiers with Napoleon in the lead, across the bridge of Arcola? What modern story can equal in adventure the wondrous tale of the youthful Macedonian who led his phalanxes across the desert and at 30 wept for more worlds to conquer? History is replete with youthful adventure; Alexander, Hannibal, Napoleon, Nelson, Decatur, Jackson, and a host of others flash across its pages with their deeds of daring and adventurous courage.

THE DRAMATIC IN HISTORY

Perhaps the dramatic appeals to the reader? What more dramatic than the council of the Athenian generals before Marathon when the Persian king, the king of kings, landed his army on Grecian shores and with his hordes threatened to extinguish forever the torch of liberty and western civilization? No stage has ever produced so dramatic a moment as when, in that council of indecision and fear, there stood forth one man who spurred his laggard comrades on to audacious attack. Does the modern drama afford spectacle half so wonderful as that of the still youthful Hannibal leading his swarthy African army across the snowy summits of the Alps—pushing his way forward with his elephants and desert soldiers, through hazardous mountain pass threatened by avalanche and savage tribes? And ever dear to the seaman's heart must be the thought of Nelson's splendid adventurous courage which sent his ships into Aboukir Bay amidst uncharted perils in the gathering darkness of the Egyptian night.

HISTORY TELLS THE STORY OF MANKIND

History tells the most wonderful stories of love and hate; of nobility and degradation; of victory attained by inborn genius and of the goal reached by plodding endeavor; of inordinate ambition, of self-sacrificing devotion; of villainy and heroism; of vice, of purity. Nations rise and fall only to have other nations grow great upon their ruins. A countless procession of gigantic characters march across its pages—each with their stories to tell, each with a lesson for the practical student of history.

FAULTY METHODS OF TEACHING HISTORY

Why, it may be asked, do so many of us find the pages of historic fiction more entertaining than the source from which the story is drawn? Is it necessary that men of trained minds and analytical power be fed in homeopathic doses? The answer perhaps lies in the fact that history means school history to us. Small time is given to history in our schools and so much is crowded into so little a period as to make history largely, it is feared, a matter of more or less unconnected dates. Few of us have enjoyed the opportunity for intensive study of any one epoch, with the fascinating detail of happenings which can alone vitalize and make human the men of the period. Historical fiction is valuable, giving, as it does, side-lights on the characters of the time, but if we are really to get the meat of history for our own development, we must also study the whole story of the period in mind.

A GENERAL KNOWLEDGE ESSENTIAL

It is well however, before taking up the study of a particular epoch, to secure a general knowledge of history, and it will be confessed, a certain number of dates must be memorized if we are to follow human progress and achievement which finds its expression in the leaders whose characters we seek to study. No book is better for this "date getting" than "Crecy's Thirteen Decisive Battles of the World," written about 1849. It may be amusing to note that this author, in his preface, makes an apology for writing of war when "the efforts of the Universal Peace Society" were thought to have made war a thing of the past. And this in 1849! The dates of the 13 battles therein given will be invaluable if committed to memory, together with a knowledge of the causes and a comprehension of the results of these battles: Marathon, Syracuse, Metaurus, Varrus and his Legions, (Teutoberg Forest), Chalons, Tours, Spanish Armada, Pultowa, Blenheim, Saratoga, Valmy and Waterloo. To these have been added Gettysburg and the Marne. It is of course, unnecessary to learn the exact year, but it is important to know within, say, 50 years of ancient battles and 10 years of the more modern combats.

THE STUDY OF MANNERS AND CUSTOMS

Having attained our first objective—a general framework of dates, we should now study manners and customs; means of transportation and communication; economic and political situations; religious and moral developments of the peoples of history at the time of each of these dates. We will now have attained: First, a knowledge of 13 dates; second, a knowledge of at least 26 important nations, from the political, economic and moral viewpoint. But little more is needed before we can take up the study of our chosen leaders, and this is, a certain ethnographic knowledge of the races from which they spring. This is perhaps more important than at first it may seem. Can we judge Cromwell and Napoleon from the same viewpoint? The Anglo-Saxon and the Latin? How can we understand the military genius if we do not understand the people from whom he springs? The third and last step brings us to a character study of the great leader whose actions in great crisis is our particular concern.

THE READER MUST DISCRIMINATE BETWEEN THE TRUE AND THE FAKE

Almost every great leader has his biographer—the lives of the military geniuses have proven a fruitful field for the labors of the men of letters. All too frequently, however, national pride has lent color to the pen of the biographer; almost all of these "lives" have been written by literary men with a necessarily small knowledge of war and of the principles upon which the Great Captain founded his seemingly miraculous successes. It is here that the student should use his native common sense; realize that the profession of arms has given comparatively few writers to the world and, while granting the thanks of posterity to the military biographer, carefully discriminate and seek to grasp the truth from the mass of ulterior information laid before him. Mahan, Jomini, Dodge and Henderson, however, have given us splendid studies from the military viewpoint. These books are *invaluable* to the naval student of history.

OUR PERSONAL INTEREST IN THE GREAT LEADERS

Having now delineated for our use the personal character of the leader we are studying; his race, his ancestry, his physical charac-

teristics, his mental and moral development, early education and surroundings, position in society, and first steps up the ladder of life and fame, we come to our hero's trial by fire, how he acquitted himself and brought victory to his banners. We cannot help but feel a thrill of *personal* interest in our leader, for we *know* him now, can reconstruct the mental processes which dictated the decision which brought him his maiden laurels. Having followed him through his youthful years of preparation we can begin to apply the lessons learned to the development of our own characters. Here we again pause for a moment to study once more the conditions which surrounded him. Is a leader as fit after a long night ride on horseback as he would have been if whirled to his destination in a few hours by a comfortable train? With his character fully before us, the attendant conditions surrounding him in mind, let us now analyze his actions from a purely military standpoint.

THE APPLICATION OF MILITARY PHRASES TO OUR STUDY

There has grown up of late years, a distinct literature on "the Art of War," in which certain apt phrases and terms have attained a recognized standing: the initiative of the subordinate; indoctrination; loyalty to the general plan. It is for us now to apply each of these terms to our hero and appreciate his fitness by the knowledge of his adherence to the great principles of war. These *principles* never change. We will find, in many cases, *seeming* violations of these principles yet a closer study will show us that these departures were almost invariably only seeming.

LEE AND NAPOLEON

Take for instance, the Campaign of Second Manassas. There the Southern General, with an inferior force: First, divided that force in face of his enemy; second, moved away from the capital he was defending; third, placed his advance force in contact with the enemy with a dangerous pass in the rear, only finally to unite his whole army astride his enemy's line of communication in time for a well-nigh decisive battle. See again how history repeats itself when the same general, under yet more dangerous conditions, executes precisely this same maneuver at Chancellersville. Strive to analyze the motives which lead up to such decisions. Upon what information did he base such hazardous enterprises? See how

the spirit of a great genius rises above apparently insurmountable obstacles to snatch victory from defeat. With a knowledge of Napoleon's character, study his brilliant campaign of Austerlitz. How did Mack (by no means a poor soldier) come to surrender an army to the emperor? Why was the Archduke Charles (one of the best soldiers of his day) rendered powerless to save his country's capital? How were the armies of Austria and Russia destroyed by a single stroke at Austerlitz?

THE HEROES OF THE SEA

We turn from the land to the sea. Drake, Hawke, Howe, Rodney, Paul Jones, Nelson, Farragut, the resolute spirit of the great sailor shines alike in all their lives. They are singularly alike, these men of the sea, in deadly earnestness of purpose, in self sacrifice to country's need, in professional skill, in daring and in courage. The life of each is a rich treasure given to the young officer of to-day to do with as he will. Neglect the study of these men, the applications of their lessons to your own career, and you throw away a shining weapon, the lack of which will hold you to mediocrity—the possession of which will go far toward fitting you for high command.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

$T=C-W$

By Lieut. Commander James C. Van de Carr, U. S. Navy

Recently, in working out a problem in Compass Error (and after looking it up in "Muir" to make sure), the writer happened to jot down the above expression and was immediately impressed with the familiarity of the term "$C-W$," as being one with which every navigator has wrestled in an effort to get his G. M. T. By placing a "T" on the other side of an equation from "$C-W$," it is promised that no navigator need ever again scratch his head, draw circles and arrows, or desperately try to remember how to apply the old rule of "true, right, east," in connection with compass work. Think it over.

$$T=C-W,$$

or true course equals compass course minus westerly error.

The "$-W$" suggests "$+E$" and it is easy to write down

$$T=C+E,$$

or true course equals compass course plus easterly error.

The above two formulas, which amount to thumb rules by remembering "$C-W$," will solve any problem in connection with compass work. As an example, the navigator gets an azimuth of the sun and finds that it bears 100 (psc). The azimuth tables show that it bears 105 (true). Jot down:

$$T=C-W \text{ and } T=C+E.$$
$$105=100+5E$$

and therefore the compass error is $5E$.

Again, it is desired to steer a certain course, say 150 (true); the compass error (variation and deviation combined) is $5W$.

$$T=C-W \text{ and}$$
$$150=155-5W.$$

The compass course is therefore 155.

The above "Wrinkle" has been so enthusiastically received, and it is so easily applied that the writer apologetically offers it to the service in spite of its elementary nature. It is especially useful in taking temporary and reserve officers over some of the rough places in navigation, where the more fortunate of us "fit, bled, and died" in our youth.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TACTICAL AND FIRE CONCENTRATION PROBLEMS AND THEIR SOLUTIONS

By LIEUT. COMMANDER H. W. HILL, U. S. Navy

PROBLEMS

I. When ordered to take position on a given bearing and at a given distance from a moving ship, find:
   (a) Change of course necessary using certain speed.
   (b) Speed necessary if a certain change of course is made.

II. When ordered to change distance from guide to maintain present bearing, find:
   (a) Change of course necessary using a certain speed.
   (b) Speed necessary if a certain change of course is made.

III. In fire concentration, to determine the bearing of the C.-in-C.'s target from ship concerned, having been signalled the bearing of that target from C.-in-C.'s flagship (*i. e.*, the General Bearing Line).

IV. In maneuvers, target practice, etc., to straighten maneuvering ship or unit up on a line which is parallel to, and at a given distance from, course of guide or target.

V. To determine whether an enemy at known range and bearing and approximately known course and speed is within torpedo range, and if so, what the desired gyro setting is.

1. The problems listed above are simple ones, but which in constantly varying form are ever present during all forms of tactical maneuvers. A quick and accurate means of solution is necessary to flag officers, commanding officers, navigators, gunnery officers and officers of the deck.

2. These problems are capable of solution by many methods, but the Battenberg Course Indicator, manufactured by the Washington Navy Yard and issued to all large ships, furnishes, in the minds of those who have tried all methods, the most practical solution. Recently a flag officer commanding a battleship division used the Battenberg Course Indicator entirely, and it was soon a remarked fact that his division, following a fleet tactical or fire concentration signal, always led all other divisions in getting the correct signal hoisted and executed.

3. Small, light, but durable, made of non-corrosive metals, so that it is readily available in all kinds of weather at any part of the bridge, it is in effect a portable, weather-proof mooring board, and requires no instruments to operate it.

4. There are three types of Battenberg Course Indicators now in use in the service. Heretofore their issue has been only to the large ships, but probably in the near future they will be supplied to cruisers and destroyer division leaders. The three types are:

(a) Mark I. Manufactured by Washington Navy Yard in 1913.

(b) Mark II. Manufactured by Washington Navy Yard in 1920.

(c) British type. Manufactured by Elliott Bros., London, Eng.

The Mark II type is shown in Plate I, and may be briefly described as follows:

The **Tray** (1) is circular, 12 inches in diameter, and its rim is graduated from 0 to 360 degrees to indicate both bearings and reciprocal bearings. Pivoted centrally in this tray are the disc (2) and three brass arms. The **Disc** (2) is grooved with parallel lines, marked alternately red and black. The **Diameter Groove** (3) is of greater width than the other grooves and has an arrow head at each end. The unit spaces of all markings on both disc and bars are of equal size.

The two **Position Bars** (4-5) are graduated from the center in units from 0-30, each unit being subdivided into two parts. These units may be used to represent any desired scale—the larger the scale chosen, of course, the greater the accuracy obtained. On the position bars are **Pointers** (6) which may be moved to any position and clamped.

One position bar represents the observer's present position relative to the guide, or ship angled and ranged upon, and the other

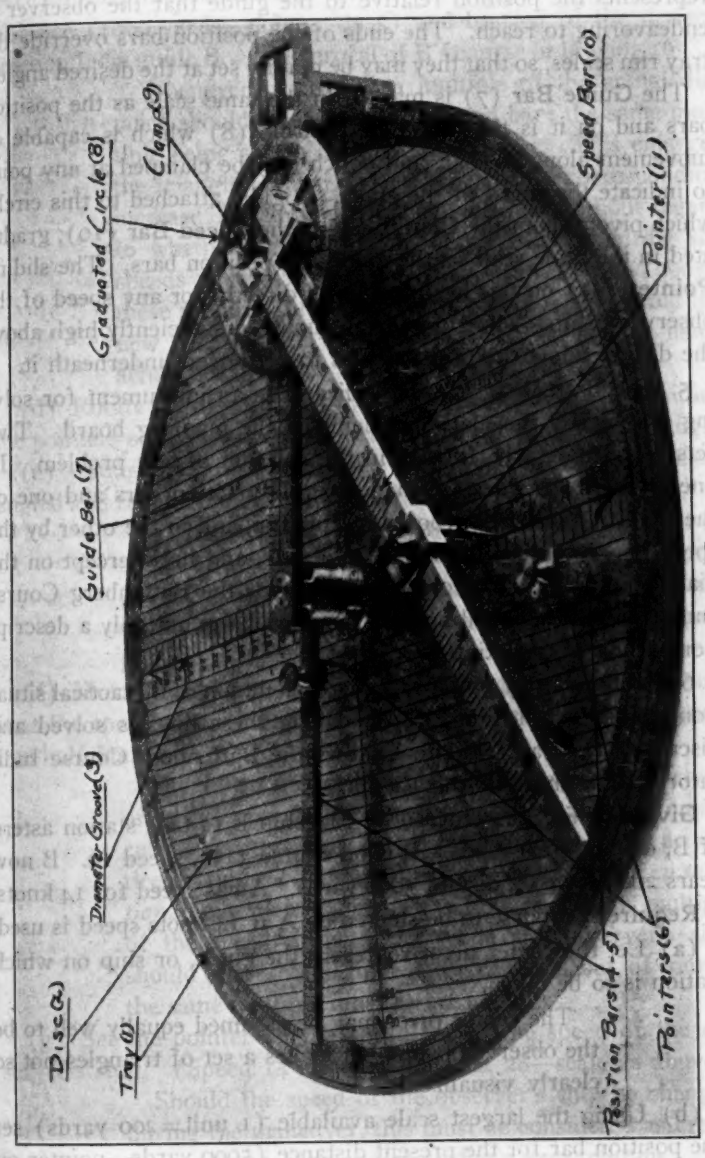

Clamp (9)
Graduated Circle (8)
Guide Bar (7)
Diameter Groove (3)
Disc (2)
Tray (1)
Speed Bar (10)
Pointer (11)
Position Bars (4-5)
Pointers (6)

PLATE I.

represents the position relative to the guide that the observer is endeavoring to reach. The ends of the position bars override the tray rim scales, so that they may be readily set at the desired angles.

The **Guide Bar** (7) is marked in the same scale as the position bars and on it is the **Graduated Circle** (8) which is capable of movement along the bar, and which may be clamped at any point to indicate the speed of the guide. Rigidly attached to this circle, which pivots about the **Clamp** (9), is the **Speed Bar** (10), graduated in the same scale as the guide and position bars. The sliding **Pointer** (11) on this bar may be set directly for any speed of the observer's ship. The guide bar is mounted sufficiently high above the disc to allow the position bars to be moved underneath it.

5. The Battenberg Course Indicator is an instrument for solving graphically the many problems of the mooring board. Two sets of triangles are formed in the solution of any problem. In one of these the sides are made by two position bars and one of the small red or black grooves on the disc, and in the other by the speed bar, its intercept on the guide bar, and its intercept on the diameter groove. A geometrical study of the Battenberg Course Indicator solutions will not be attempted here, but only a description of how the solution is reached.

6. Problem I (a) presents the most common of all tactical situations and the following problem along these lines is solved and discussed in detail. (Plate I shows the Battenberg Course Indicator set for this solution.)

Given: Ship A is ordered by Flagship B to take station astern of B, distant 1000 yards. B is on course 345°, speed 12. B now bears 260° from A, distant 5000 yards. A has speed for 14 knots.

Required: Course to be steered by A if 14 knots speed is used.

(a) Let the center pivot represent the guide, or ship on which station is to be taken.

The center pivot may be assumed equally well to be the observer's ship, but makes a set of triangles not so clearly visualized.

(b) Using the largest scale available (1 unit=200 yards) set one position bar for the present distance (5000 yards—pointer on 25) and bearing of the observer's ship from guide B. (Reciprocal bearing 260°.)

(c) Using the same scale set the other position bar for the distance (1000 yards—pointer on 5) and bearing of the desired position from guide B. (Reciprocal of B's course or bearing 165°.)

Whenever practicable a multiple of the actual distance should be set on the position bar; the same multiple being set on both bars, of course. This enlarges the triangle formed and so makes for a corresponding increase in accuracy. This may be done without regard to whether any multiple will be used in setting the speeds on the guide and speed bars, for, as noted above, these are arms of an entirely separate triangle, and the new triangle will be similar to that formed by using actual distances.

(d) Rotate the disc till the grooves run parallel to a line joining the pointers on the two position bars. This completes this triangle.

(e) Clamp the guide bar on the course of the guide, or vessel angled and ranged on. (Guide's course 345°.)

If the problem to be solved is one arising from an actual or prospective change of course by the guide, the guide bar should be set for the *New Course—i. e.,* the course that will be taken by the guide before the completion of the maneuver.

(f) Move the graduated circle along the guide bar and clamp it at the speed of the guide. (Clamp at 24—scale one unit equals one-half knot.)

Should the guide change speed during the maneuver, or by zigzagging have a resultant loss in advance on the course set, this must be considered as creating an entirely *new problem,* and therefore requiring a *new solution.* In order to obtain greater accuracy, a multiple of the speed of both the guide and observer's ship should be set on the guide and speed bars, but, of course, the same multiple must be set on both.

(g) Set the pointer on the speed bar at the speed of the observer's ship. (Speed 14 knots. Clamp at 28—scale as above.)

Should the speed of the observer's ship be changed during the maneuver, this must be considered as creating a *new problem* and requiring a *new solution.*

(h) Swing the speed bar around till its pointer comes to the diameter groove on the disc. The reading of the graduated circle

shows the number of degrees (37) to the left of the guide's course which must be steered to obtain the desired position under assumed conditions of course and speed. The course to be steered, therefore, is 308 degrees. *Answer.*

It will be noted that there are two solutions to every problem, due to the fact that the speed bar may be swung either to right or left to its position relative to the diameter groove. The problem, when set on the Battenberg Course Indicator, however, becomes self-apparent. A general rule is that the long end of the speed bar must be on the same side of the guide bar as the position bar which represents the present position of the observer's ship. No rule is necessary to determine whether the change of course should be made to the right or left.

7. In most instances changes of course will be made in multiples of 10 or 15 degrees. When the change of course is 10, 15, 20, 30, 45, or 60 degrees, the sines of which are easily kept in mind, the time for completion of a maneuver can be readily computed mentally. The sines of these angles are, roughly:

10 degrees—1/6.
15 degrees—1/4.
20 degrees—1/3.
30 degrees—1/2.
45 degrees—7/10.
60 degrees—7/8.

8. Therefore, if in a maneuver one finds that 1000 yards must be gained to the left and the change of course is 30 degrees, speed 12 knots, the time required to run before straightening up on the base course may be quickly computed as 5 minutes. (12 knots—400 yards per minute. Since 30 degrees=$\frac{1}{2}$, or gain to left in 1 minute is 200 yards. In 5 minutes 1000 yards will be gained to left.)

9. The Battenberg Course Indicator supplies quickly the information needed for the above problem—as to distance to be gained to the flank. After it is set for the data of the problem, rotate the disc till the red and black grooves are parallel to the guide bar, or course of the guide. Now count the number of grooves between the pointers of the two position bars and multiply this by the num-

ber of yards per space between grooves, according to the scale used on the position bars.

10. The use of the disc as described above is a handy one, and may be used for many problems. For instance, with the fleet in column, suppose a formation signal is made which requires the van division to take station 30 degrees abaft the port beam of the guide (center) division distant 4000 yards. The Battenberg shows a big change necessary, but for sake of example, let us assume that a "Ships left 90 degrees" signal is made. As the ships of the van division run out, successive problems may be made from each range and bearing obtained of the guide, and when the ships are 1000 yards, or the distance of their advance, from the line parallel to the guide's course running through their desired position (shown by the Battenberg by method described in above paragraph), "Ships right 90 degrees" may be executed and the ships straightened up on their base course. They are now "on the line," and distance may be gained or lost on that line to bring them to the required bearing. A person experienced in the use of the Battenberg should be able to straighten up on the base course and pick up speed, within a very few degrees of the required bearing.

11. The following problems are solved and discussed to illustrate more clearly the uses of the instrument. In these solutions each setting is enumerated, making it appear slow and complicated. *It is to be emphasized, however, that all but one or two settings are kept corrected up to date at all times, so that when the signal is made to execute a certain maneuver, the correct course may be almost immediately determined.*

Problem I.—**Given:** Ship A is ordered by Flagship B to take station, astern of B, distant 1000 yards. B is on course 345 degrees, speed 12. B now bears 260 degrees from A, distant 5000 yards. A has speed for 14 knots.

Required: (1) Course to be steered by A if 14 knots speed is used.

(2) Speed required if it is desired to steer course 315 degrees.

Solution (1) has already been discussed in Par. 6.

Solution (2):

(a) a, b, c, d, e, f, of this solution are the same as in the solution of (1) discussed in Par. 6.

(b) It is desired to steer 315 degrees, which is 30 degrees to the left of B's course. Therefore, swing the speed bar (to the right

of the guide bar—or on the same side of it as the position bar showing the present position of ship) till the graduated circle reads 30 degrees.

(c) Now move the pointer along the speed bar till it is over the diameter groove. Its position on speed bar, 26.2, indicates a speed of 13.1 knots necessary. *Answer.*

Problem II.—**Given:** Ship A, now in position 45 degrees on starboard bow of Flagship B, distant 2000 yards, base course 270 degrees, speed 12 knots, is ordered to open distance to 3000 yards, maintaining present bearing. A has boiler power for 17 knots.

Required: (1) To find change of course possible using 14 knots.

(2) To find speed necessary changing course 15 degrees to right.

Solution (1):

(a) From an examination of conditions it will be seen that one of the triangles is eliminated in this problem, *i. e.*, the triangle formed by the position bars and diameter groove becomes a straight line. Therefore

(b) Rotate the disc until the diameter groove is coincident with position bars, *i. e.*, to the bearings of Flagship B from ship A (135 degrees). The position bars need not be set on this bearing.

(c) Clamp the guide bar on course 270 degrees.

(d) Clamp the graduated circle at B's speed—12 knots. (Clamp at 24—scale one unit equals one-half knot.)

(e) Set the pointer on the speed bar for A's desired speed—(14 knots). (Pointer at 28—scale one unit equals one-half knot.)

(f) Swing speed bar as directed in par. 6 (h). The graduated circle gives a reading of 9 degrees, which in this case is the desired change of course to be made to the right by ship A (the present base courses of ships A and B are the same). *Answer.*

Solution (2):

(a) a, b, c, d, of this solution are the same as in Solution (1) above.

(b) It is desired to steer 285 degrees, which is 15 degrees to the right of B's course. Therefore, swing the speed bar until the graduated circle reads 15 degrees.

(c) Now move the pointer along the speed bar until it is over the diameter groove. Its position on the speed bar, at 32.7, indicates a speed of 16.4 necessary.

Problem III.—**Given:** The fleet deployed in battle formation. Fleet Flagship A bears 15 degrees (true) from ship B, distant 2200 yards. Fleet course is 360 degrees. Enemy is on port beam of fleet. A's corresponding ship in the enemy line is distant 15,000 yards. Flagship A hoists G. B. L. signal "My target bears from me 275 degrees. Concentrate according to plan." In order to make concentration plans the fleet flagship's target must first be identified by ship B.

Required: The bearing of fleet flagship's target from ship B.

Solution:

(a) After deploying into battle formation, individual ship or division maneuvering practically ceases, and therefore the Battenberg Course Indicator may be kept ready for this problem, and its setting kept corrected, during the battle approach, for the range and bearing of the fleet flagship, and also, if visibility is good, for the approximate range and bearing of B's corresponding ship in the enemy line.

(b) Assume the fleet flagship A to be at the center pivot.

(c) Set one position bar for range 2200 yards (pointer on 4.4—scale one unit equals 500 yards), and reciprocal bearing of Flagship A—195 degrees.

(d) Set the other position bar for range of B's corresponding ship in the enemy line (pointer on 30—scale one unit equals 500 yards), which is also the approximate range of the flagship's target from the flagship.

(e) When the signal is made, set position bar (step d) on signalled bearing (G. B. L.)—275 degrees.

(f) Rotate the disc until the grooves are parallel to the line adjoining the pointers of the two position bars.

(g) The reading of the rim scale of the tray marked by the arrow head on the end of the diameter groove is the bearing of the fleet flagship's target ship B, in this problem 283½ degrees.

NOTE.—Having this bearing of the flagship's target, it may be readily identified by glancing over an azimuth circle on a pelorus and its numerical position in the enemy line fixed. Then considering the number of enemy ships ahead or astern of this target, relative to our own battle line, the concentration plan may be quickly decided upon.

Problem IV.—**Given:** Ship A is making a run on target B, and wishes to reach a point where she may parallel target B's course, when latter bears 65 degrees to the right of this base course, on a

line which will be 10,000 yards abeam of target B. Speed of B is estimated at 7 knots, course 360 degrees, and A's speed is 20 knots. Target B now bears from A 72 degrees, distant 22,000 yards.

Required: (1) To find the course which must be set to allow straightening up on the proper line when the target bears 65 degrees true (*i. e.*, 65 degrees to the right of the base course).

(2) To find the approximate time required to reach the turning point, so that the gunnery officer may be notified.

(3) Assuming A's advance for a 60-degree turn to be 800 yards, what will be the range of the target at the proper movement to put the rudder over when straightening to the base course?

Solution (1):

(a) Set guide bar on course (360 degrees) of target B.

(b) Set one position bar for position abeam of target B or bearing 270 degrees, distance 10,000 yards. (Pointer on 10—scale one unit equals 1000 yards.)

(c) Rotate the disc until the grooves are parallel to the guide bar.

(d) Set the other position bar for the bearing of the desired position (245 degrees, or the reciprocal of 65 degrees) and note where the grooves passing through the pointer of the first position bar cut this bar. In this example 11.10—11,100 yards. (Scale one unit equals 1000 yards.)

This is the range of position desired.

(e) Having found the range and bearing of this desired position, this now becomes a simple problem and may be solved as described above in par. 6. The correct solution shows the desired course to be 60¼ degrees. For sake of example, let us use 60 degrees. *Answer.*

Solution (2):

(a) The Battenberg Course Indicator is set for solution (1). Now rotate the disc until the red and black grooves are parallel to the guide bar, or base course of target B.

(b) Count the number of spaces between the grooves running through the pointers of the two position bars. (In this case 10.8.)

(c) Multiply this number by the yards per space (in this case 1000 yards) or $10.8 \times 1000 = 10{,}800$ yards.

(d) Following the method described in par. 8. Twenty knots—666 yards per minute. Cos. 60 degrees = ⅔. Ship A will close at

the rate of 666 cos. 60 degrees = approximately 580 yards per minute. The time required in problem will therefore be

$$\frac{10{,}800}{580} = 18\tfrac{1}{2} \text{ minutes.} \quad \textit{Answer.}$$

NOTE.—For this approximate solution it is not necessary to correct for the time of turning.

Solution (3):

(a) Let us assume that the approach has been made correctly and that when about to turn the target B bears 66 degrees from A.

(b) Set both position bars on bearing 245 degrees (reciprocal of 65 degrees) with one pointer marking the distance from the target that ship A will be when on her line at that bearing.

(In this case, as found in solution (1), 11,100 yards.)

(c) Add 800 yards (assumed advance) to this distance which is the point at which the rudder should be put over, or range 11,900 yards.

(d) Due to many causes the approach, as assumed in (a), will not be perfect. If not, the same method of locating the desired *line* must be used as described in solution (1) of this problem, and the advance added to the range of the line at the actual bearing.

Problem V.—**Given:** Ship A steaming on course 350 degrees, speed 18 knots, is engaging enemy ship B, bearing 95 degrees, distant 13,000 yards, on estimated course 330 degrees, and speed 17 knots. A's torpedoes are good for range 10,000 yards at 30 knots, 12,000 yards at 26 knots, and 15,000 yards at 22 knots. Ship C, of A's fleet, bears 150 degrees from A, distant 2000 yards, course and speed the same.

Required: (1) To find if the enemy is within torpedo range, and if so what is the highest of the three speed settings that can be used.

(2) To find with what gyro angle setting the torpedo must be fixed.

(3) When fired with this setting, will the torpedo pass 500 yards ahead of ship C, assuming it runs true?

Solutions (1) and (2):

(a) Set the guide bar for the estimated course 330 degrees and speed 17 knots of enemy ship B.

(b) Set one position bar for the range 13,000 yards and reciprocal bearing 275 degrees of ship B.

(c) Set the pointer on the speed bar for the highest speed, 30 knots, of torpedo.

(d) Swing the speed bar till its pointer—set as in (c)—reaches the line between the center pivot and the pointer on the position bar. (It will be noted that the center of the pointer on the position bar is about 1/16 of an inch from the edge of the bar.) This completes the speed triangle.

(e) Note the reading of the graduated circle. (In this case 97 degrees.)

(f) Rotate the disc until its grooves are parallel to the speed bar.

(g) The reading of the scale on the tray rim opposite the arrow head on the diameter groove, in this case 67½ degrees, shows the true course which must be made by the torpedo in order to hit, at 30 knots speed, an enemy vessel on course 330, speed 17, now bearing from A 95 degrees true. This hit will be made irrespective of the range, provided that the range, measured along the torpedo track, is not in excess of 10,000 yards, the assumed maximum.

(h) Now consider the speed bar as a range bar (the scale is the same as that of the position bars) and set its pointer for the maximum range for 30 knots, *i. e.*, 10,000 yards.

(i) Keeping the speed bar at the angle obtained above, in (e) and (f), slide it along the guide bar until its pointer again reaches the line between the center pivot and the pointer on the position bar. This completes the range triangle, maintaining the angle between the course of the torpedo and the present bearing of enemy ship B.

(j) If the pointer on the position bar is closer to the center pivot than the pointer on the speed bar set, as in (i), the target is within range for this speed of the torpedo, otherwise not.

(k) This problem, when solved for a torpedo range of 10,000 yards, speed 30, shows the target to be about 1000 yards out of range.

(l) The solution, by the same method, for a torpedo range of 12,000 yards, speed 26, shows the target to be well within range, and the true course for the torpedo to be 62½ degrees. As A's course is 350 degrees, this is a course 72½ degrees to right of A's

course and will require a gyro setting of 17½ degrees left on the torpedo. *Answer.*

Solution (3):

(a) This is a problem similar to others previously described. Assume ship C to be at the center pivot.

(b) Set one position bar for range 2000 yards and reciprocal bearing of C from A (330 degrees).

(c) Set the other position bar on C's course 350 degrees, and the distance 500 yards; it is desired that the torpedo pass ahead of C.

(d) Rotate the disc until the grooves are parallel to the line joining the pointers on the two position bars.

(e) Set the guide bar for C's course 350 degrees, and speed 18 knots.

(f) Set the speed bar for the torpedo's speed 26 knots, and swing it until it cuts the diameter groove, extended. The graduated circle on the guide bar reads 131 degrees. This shows that the torpedo could be fired on course 350 degrees plus 131 degrees—121 degrees and still pass 500 yards ahead of C. Looking at it in another way, it may be figured that the torpedo may average as little as 10½ knots on its course 62½ degrees true and still pass 500 yards ahead of C. *Answer.*

13. It will be seen from the above problems that the Battenberg Course Indicator is an instrument capable of solving almost any type of problem which may confront an officer of the deck, navigator, captain, or flag officer during maneuvers and battle, and it is sincerely hoped that its value will be fully utilized by the units of the fleet.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A SOLUTION OF THE OFFICER PERSONNEL SITUATION

By LIEUT. COMMANDER F. G. BLASDEL, U. S. Navy

The officer personnel situation in the navy to-day presents two problems that will necessarily have to be solved in the near future. The first is that of *promotion*. The second and the harder to solve, is the elimination of staff corps in so far as practicable.

I have endeavored to present my solution of these problems in the following proposed legislation which has been formulated from a study of the many plans put forward at various times by other officers of the navy and from a study of the question off and on during the past seven years.

PROPOSED LEGISLATION

That, on the date of the approval of this act, all staff corps in the navy, except the medical corps, dental corps and chaplain corps, shall be amalgamated with the line, and all staff officers, except those in the medical corps, dental corps and chaplain corps, shall be transferred to the line of the navy and assigned seniority in their several ranks and grades in accordance with their total length of naval service; *Provided,* That the rank of any officer shall not be reduced by anything contained in this act; and *Provided,* further, That all officers hereafter promoted from one rank, or grade, to another shall take rank at the foot of the list of officers in the rank or grade to which they are promoted in the order in which they are promoted.

That, hereafter, the total number of commissioned officers, excluding those in the medical corps, dental corps and chaplain corps, authorized on the active list of the navy shall be six per cent (6%) of the total enlisted strength of the navy divided as nearly as practicable among the several ranks in accordance with

the following percentages: Rear admiral, one per cent (1%); captain, four per cent (4%); commander, seven per cent (7%); lieutenant commander, fourteen per cent (14%); lieutenant, lieutenant (junior grade) and ensign, combined, seventy-four (74%).

That the number of officers authorized in the medical corps shall be one-half of one per cent (½%) of the total authorized strength of the navy, including both officers and men, divided as nearly as practicable among the several ranks in accordance with the following percentages: Captain, five per cent (5%); commander, seven per cent (7%); lieutenant commander, fourteen per cent (14%); lieutenant and lieutenant (junior grade), combined, seventy-four per cent (74%): *Provided,* That there shall be allowed two officers of the relative rank of rear admiral in the medical corps to be promoted by seniority from those officers of the relative rank of captain.

That the number of officers authorized in the dental corps shall be ten per cent (10%) of the number authorized in the medical corps divided as nearly as practicable among the several ranks in accordance with the following percentages: Lieutenant commander, twenty-six per cent (26%); lieutenant and lieutenant (junior grade), combined, seventy-four per cent (74%).

That the number of officers authorized in the chaplain corps shall be one for every four thousand (4000) of the total authorized strength of the navy, including both officers and men, divided as nearly as practicable among the several ranks in accordance with the following percentages: Captain, five per cent (5%); commander, seven per cent (7%); lieutenant commander, fourteen per cent (14%); lieutenant, lieutenant (junior grade) and ensign, combined, seventy-four per cent (74%).

That all officers hereafter appointed in the line shall be commissioned as ensigns from graduates of the Naval Academy, or from the enlisted personnel and warrant officers of the navy, after physical and professional examination.

That all officers hereafter appointed in the medical corps, dental corps and chaplain corps shall be appointed in the lowest grade in the respective corps from graduates of colleges after professional and physical examination.

That the several grades in the medical corps shall be as follows: Assistant surgeon with rank of lieutenant (junior grade), passed

assistant surgeon with the rank of lieutenant, surgeon with the rank of lieutenant commander, medical inspector with the rank of commander, medical director with the rank of captain and surgeon general with the rank of rear admiral.

That the several grades in the dental corps shall be as follows: Assistant dental surgeon with the rank of lieutenant (junior grade), passed assistant dental surgeon with the rank of lieutenant and dental surgeon with the rank of lieutenant commander.

That chaplains shall be commissioned as chaplains and promoted in rank as hereinafter provided.

That the total number of line officers assigned permanently to staff duty shall not exceed twelve (12) with the rank of rear admiral, seventy-two (72) with the rank of captain, one hundred and twenty-two (122) with the rank of commander and two hundred and forty-four (244) with the rank of lieutenant commander.

That not more than twenty (20) officers of the line, of, or above, the rank of commander may be detailed permanently for engineering duties only.

That officers of the medical corps, dental corps and chaplain corps shall take rank with each other and with officers of the line in the same rank or grade in accordance with their total naval service as commissioned officers.

That, hereafter, the duties heretofore performed by officers in the construction corps, supply corps, civil engineer corps and corps of mathematics, shall be performed by officers detailed from the line for that purpose.

That all officers shall be promoted, if fully qualified both physically and professionally, upon completion of service in grade as follows: Ensign, three (3) years; lieutenant (junior grade), three (3) years; lieutenant, eight (8) years; lieutenant commander, six (6) years; commander, six (6) years; captain, seven (7) years.

That hereafter officers of the navy, both on the active and reserve lists, shall be retired upon reaching the age of sixty-four (64) years, or for *total* physical disability incurred in line of duty.

That ensigns shall perform two years line duty and one year engineering duty.

That lieutenants (junior grade) shall perform one and one-half (1½) years line duty, one (1) year detail on staff duty and six (6) months engineering duties.

That lieutenants shall perform four (4) years line duty, two (2) years engineering duty, and two (2) years detail on staff duty.

That line officers of the rank of lieutenant commander, who are not permanently detailed for staff duty, shall perform five (5) years line duty, and one (1) year engineering duty.

That whenever the number of officers in any corps, in a grade, or rank, of, or above, that of lieutenant commander and below that of rear admiral, exceeds the number herein authorized, the necessary reduction in numbers shall be made by selecting out those officers least qualified for duty in the navy; *Provided,* That the officers selected out shall be placed upon a reserve list and shall be available for any duty to which they may be assigned either under the Navy Department, or any other department of the government; *Provided,* further, That officers on the reserve list shall be promoted in the same manner as if they had remained on the active list but not above the rank of captain; *Provided,* further, That officers on the active list below the rank of lieutenant commander may be transferred to the reserve list if found unsuited, for any reason, to perform all the duties of their rank on the active list; and, *Provided,* further, That transfers to the reserve list, in accordance with this act, shall be made upon the recommendation of a board of nine officers of the rank of rear admiral for the line; a board of nine officers of the medical corps, not below the rank of captain, for the medical corps and dental corps, all the members of which shall be senior to any officer recommended for transfer to the reserve list; and a board of three chaplains for the chaplain corps, all the members of which shall be senior to any officer recommended for transfer to the reserve list.

That officers on the reserve list shall not be eligible for transfer to the active list.

That officers now on the retired list of the navy and not totally disabled may, in the discretion of the Secretary of the Navy and upon their own request, be transferred to the reserve list and if so transferred shall take rank in accordance with their total active naval service since graduation from the Naval Academy, or their appointment as commissioned officers.

That all staff officers who are transferred to the line by the provisions of this act shall be permanently detailed to such staff duty as they have heretofore been performing.

That officers of the navy, either on the active or reserve list, assigned to duty under other departments of the government shall not be entitled to any pay other than as an officer in the navy.

That nothing contained herein shall reduce the rank, or pay, of any officer now in the navy.

That all officers on the reserve list shall be available for duty with the navy in time of war, or other national emergency.

That all laws, or parts of laws, inconsistent with the provisions of this act, are hereby repealed.

Discussion

I will not attempt to discuss the reasons for the utter failure of the present system of promotion; *i. e.*, by "selection up." However theoretically correct the system may be, it has failed dismally in its practical application and has left in its wake a disheartened, disgruntled and unhappy personnel.

The great trouble with the several methods of promotion tried out heretofore has been that they have only met the situation as it existed at the time. What the navy needs is a steady flow of promotion which will be permanent and which will meet any contingency that might arise. Such a system must be absolute and can be obtained only by "selection out." A combination of "selection up" with "selection out" is unnecessary, for if a certain percentage of officers are eliminated from those who have had the same advantages, the difference in efficiency of those remaining would be so small as not to justify "selection up," which, whatever may be said in its favor, has many inherent defects.

Any system of promotion must be fair both to the government and to the personnel.

The government which takes young boys and, at a considerable cost, educates and trains them for a life time service in the navy, has the right to expect their services for life. By this I do not mean that resignations should not be accepted, but rather that the officers, having been trained for, and in, a highly specialized profession, will, with few exceptions, remain in the navy for life. On the other hand, the officers, having entered the service of the government with its many hardships and disadvantages, expect their services to be retained by the government as long as they prove satisfactory.

So, in order to obtain a fair basis on which to work—and nothing but a plan that is founded on a fair basis will work—we must assume that officers entering the navy will remain in the government service for life or until retired for age.

Granting this assumption, one will naturally ask: "What is to be done with those selected out?" The answer to this is found in the fact that the government employs thousands of men in positions under all departments for which naval officers are ideally fitted both by education and training. Those officers "selected out" could certainly be used to great advantage by the government in such places. Most assuredly officers of the navy could be used advantageously in the diplomatic and consular services as well as many others.

The legislation as proposed, in so far as promotion is concerned, can meet with no objection from the personnel, as it is fair to them, provides a uniform promotion at all times, and gives an assurance that as long as they "deliver the goods" for the nation, the government will retain them in service.

It is fair to the government because instead of paying many officers who have been retired for slight disability three quarters pay for doing nothing, it will retain their services in positions where they will be able to work efficiently.

Under the present system, an officer has very little, if any, assurance for his future. He may be retired as an ensign on three-quarters pay for some slight physical defect, such as deafness. What happens to him? Does the government allow him to work? It certainly does not, as he is prohibited by law from accepting a position with any firm or company which has, or may have, a contract with any department of the government. This practically means that a retired officer can be a teacher, or a farmer, and nothing else. He cannot accept a government position and get the full pay of the position and he is absolutely prohibited from entering the diplomatic or consular service of the government. These are a few of the reasons why I have included a provision about retired officers in the proposed legislation.

In figuring up the number of officers in the several ranks, you will find that possibly 1600 will ultimately be in the rank of captain on the reserve list and a proportionate number in other ranks. Some emphatically state that the Congress would never pass anything like that. That is ridiculous, for they are only retaining the ser-

vices of those the country has paid to educate, and employing them in positions, the total pay roll of which to-day is far and away greater than the total pay of all the officers on the reserve list would amount to. The watch-word of to-day is "economy." This legislation would certainly be a measure of economy as it would eventually fill all important positions in the government service with highly educated, trained men at probably a less cost than such positions are now filled and at certainly an enormous saving to the country in the payment for a retired list. It would certainly result in increased efficiency in the other government services.

The proposed legislation would solve the officer personnel question in time of war, which is a point not to be neglected.

The ardent selectionists will state in regard to this proposed method that the best men will not go to the top. If there are any "best men" in the navy to-day, the present "selection up" system has certainly not resulted in their going to the top. I cannot see that the flag officers in the navy of to-day are any better, if as good, as those from John Paul Jones, down through Farragut, Porter and Robley D. Evans. So far as I know, the navy did not suffer from the lack of efficient officers in any rank in the days before "selection up."

The advocates of the "plucking board" system neglect to take into consideration that the personnel selected out must be provided for in some way or else the system will ultimately be eliminated. Give officers "selected out" means of support with nothing to do but work against a system that they consider has used them unjustly, and it is only a question of time before a change in the system will be forced. A man that has a duty to perform, whatever it is, has not much time to protest against imagined injustices of the past.

As regards the question of the amalgamation of the staff corps (except the medical, dental and chaplain corps) with the line—there is a well defined conviction among line officers that we have too many staff officers in the navy, and I have no doubt that the officers in each staff corps believe that their corps has too few. As a matter of fact, there are approximately two line officers for every staff, or non-combatant officer, in the navy, which would appear to be rather a small ratio for a fighting force.

Unquestionably an amalgamation would result in increased efficiency by the elimination of petty jealousies, by a more cordial

co-operation in the service and by a co-ordination of minds and methods.

In addition, the number of officers could be materially reduced, every officer could be used to the best advantage, and the number of officers qualified for all duties on board ship would be increased. This last is of vital importance in these days, as the World War demonstrated the necessity of an increase in the complements of combatant officers for war purposes.

To summarize, the proposed legislation, quoting the words of Commander R. A. Koch, U. S. Navy, would result in:

1. "High average ability on the active list."

2. "Promotion to the various grades at a suitable age to get all out of an officer there is in him."

3. "Selection to duty and assignment in accordance with special qualifications."

4: "*Esprit de corps,* team work, initiative, mutual confidence."

And in addition, would:

1. Be permanent as it would meet any possible contingency.

2. Eliminate practically all dissatisfaction.

3. Be a measure of economy for the government.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership

Life, regular and associate, 5487. New members, 8. Resignations, 3. Dropped, 2. Deaths, 3:
Lieutenant A. C. Kozlowski (S. C.), U. S. N.
Captain A. J. Minnis, U. S. M. C.
Mr. C. A. Post.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The cost, per member, however, decreases with an increase in membership.

Dues

The annual dues ($3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions

Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about $2.25 a page.

Address of Membres

To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers notify the Secretary and Treasurer of every change of address, without delay.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Landing Force and Small Arms Instructions, 1920, is now ready for issue. The price is $1.00 per copy.

The first part of November the Institute will have ready for distribution a new book entitled "Airplanes, Airships, Aircraft Engines" by Lieut. Albert Tucker (C. C.), U. S. Navy. The price of this book will be $3.50.

The Seaman's Hand Book, containing much valuable information for enlisted men, particularly those of the deck force, has been added to the Institute's publications. This excellent little book is retailed at 65 cents per copy.

Index to Proceedings

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed. Price, bound in cloth, $2.35; bound in paper, $1.85.

Articles

The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to the Navy Department when the original is published, as required by General Order No. 46, of May 20, 1921.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Notice

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147, 173, 215 and 217 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., November, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO	I
PUBLICATIONS, U. S. NAVAL INSTITUTE	(2)
SPECIAL NOTICE	1854
TOPICS FOR ESSAYS	1855

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER R. A. HALL, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING. NAVAL POLICY. MATÉRIEL. PERSONNEL. MERCHANT MARINE.	France	1791
	Germany	1798
	Great Britain	1800
	Japan	1810
	United States	1816
AERONAUTICS		1824
NAVIGATION AND RADIO		1840
ENGINEERING		1841
ORDNANCE		1843
MISCELLANEOUS		1844
CURRENT NAVAL AND PROFESSIONAL PAPERS		1846

FRANCE

THE CHANGING ELEMENTS OF SEA POWER.—If from 1870 to 1900 the French Navy can be said to have adhered to a policy of her own, in turn indulging in *gardecôtes*, battleships, small *torpilleurs*, *croiseurs-cuirassés*, and *croiseurs-corsaires*, there began with the 1900 Lanessan program a new period that extended up to the war, in which Gallic constructors sought their inspirations mainly in Great Britain. Thus the *Patrie* type was meant to outdo the British *Majestic;* the *Danton* was an improved copy of the *Lord Nelson*, the *Bouclier* class of destroyers embodied the good points of the British "rivers," the *Barts* owed something to the designs of the British-built *Sao Paulo*, and the *Bretagne* was a pretty close copy of the *Orion*. And no wonder, since the great bulk of French naval men professed openly the British "Doctrine Navale" (expounded by Daveluy and Darrieus) on all important questions of tactics and of strategy; and, as happens often enough, the imitators went further than the model they were copying. They prepared solely and exclusively *la bataille d'escadres*—fleet actions—and the Lapeyrére program (28 battleships) was framed on the assumption that the gun alone mattered, and consequently comprised none of the fast fleet auxiliaries for which the shipbuilding policy of Lord Fisher so wisely provided.

To-day the position has been completely reversed. *Les Français brulent ce qu'ils ont adoré.* Just like Percy Scott in England, Daveluy (the French Mahan) finds pleasure in torpedoing the battleship idea and in sapping the very foundations of the Doctrine Navale which he contributed so much to bring into existence. True, battleships yet preserve many influential partisans in the service, especially among flag-officers and captains; but in a few years those conservative-minded *cuirassèphiles* will have joined the dense and thick ranks of the retired navy, *de la marine d'hier*, and will no longer possess "*voix au chapitre*" or consulting vote. And, of course, it would be futile to ignore the fact that the great majority of our young or

younger *officiers de vaisseaux* are very far from entertaining in their hearts the same gun and armor worship that has so long been the gospel of their fathers. Sad to note, they show scant respect for the mighty battleships of the *Bart-Bretagne* types, being struck less with the hitting powers of these *imposantes citadelles flottantes* than with the size and vulnerability of the target which they represent to mines, torpedoes and aerial bombs. In the minds of many there is a conviction that the incompleted *Normandies* will be the last of French battleships. The battleship not only has lost its former prestige but it is considered to be unsuited to France's needs.

In this respect it is not too much to say that a new era begins for the French Navy which will henceforth forge ahead, strictly on lines of her own, little influenced by what great ocean powers like Great Britain, America, and Japan can do, and this for both financial and doctrinal reasons. The cost of battleships is becoming prohibitive, save for the richest powers, and solely for those powers that are, from their geographical positions, freed from the heavy military obligations that will ever be the lot of France so long as she has to live side by side with a united and over-populated Bocheland; and, on the other hand, the development of torpedo and aerial flotillas is attaining such proportions, and entailing such expense, that even if France could afford to increase twice over her *Budget de la Marine* (this year amounting to some 1,200,000,000 francs, including the expenditure for the Guist'hau program) she could not manage to simultaneously have an efficient battle-fleet and adequate flotillas.

It is felt that henceforth sea power will be represented by two distinct classes of navies, viz., those relying on large armored fleets for the command of the oceans and those composed entirely of *poussière navale* of a "*défense-mobile*" order. The question for France is whether she is to rank last among ocean powers, or to lead among "*les marines-défensives.*" Without denying the fighting worth of the latest types of armor-clad (a point on which even *jeune école* protagonists are careful to express themselves with prudence and moderation), the majority of our naval and Parliamentary men are fond of picturing France as "*la première des marines sousmarines et aériennes,*" and as being in a position, by virtue of her geographical situation, to command the most important European sea routes.

The Guist'hau program (6 cruisers, 24 destroyers, and 36 submarines), is merely a "*programme de transition,*" the result of painstaking and creditable efforts consented with a view to giving the illusion "*de faire quelque chose.*" In reality it satisfies nobody. It is no secret that Chief of General Staff Grasset and all our gunnery experts would have welcomed, instead of an overgrown 8000-ton scout, a bona fide fighting cruiser of some 12,000 tons; and—by the way—not a few French officers have sympathy with the strike-hard-and-run idea embodied in the British *Glorious.* Conservative old officers who cling to the battleship openly sneer at those so-called Guist'hau *éclaireurs* that will scout "*en théorie*" for a phantom fleet, whilst uncompromising partisans of "*poussière navale*" pure and simple are denouncing the madness responsible for the construction, in these times, of "vulnerable show mastodons of 8000 tons!"

M. Delpierre, the able editor of the "*Moniteur de la Flotte,*" has on the question of the naval policy suitable to France sought the opinion of some three score *officiers de vaisseau,* mostly of the younger generations, and the results of this consultation he sums up as follows:

1. France owes to her traditions and prestige, as well as to her comprehensive maritime and colonial interests, to remain a first-class sea power; all the more so as her military power and security on land depend to a great and growing extent on her efficiency at sea and in the air. Practical unanimity exists on this point, especially since events are showing that alliances are essentially precarious and constitute no firm ground to build upon. Therefore the need of planning and acting just as if friends of to-day could become the enemies of to-morrow, and building a naval

force strong enough to discourage aggression on the part of the strongest powers.

2. The French fleet, for the immediate future at least, needs no battleships, for the twofold reason that armored fleets can never again rule the waves and that France is too poor to construct them. For the price of three 50,000-ton battleships, that would cost over one milliard francs and have mostly a nominal value, 200 submarines could be built that would count very much in the balance of sea power.

3. Therefore the naval effort must exclusively aim at supremacy for three classes of weapons, viz., submarines, flying machines, and supercannon. "*Il faut faire peau neuve,*" the past to be erased, and a blank slate to write upon.

A truly attractive dream on paper, but it is only a dream. No masterpieces of eloquence and literature and no magic stroke can possibly change in a few days, or in a few years, the "orientation," the ways and methods of that antiquated and venerable institution called "*l'amirauté de la Rue Royale,*" that will be for many years to come in the hands of highly estimable *officiers de vaisseau,* who only know and appreciate that part of their trade that concerns pre-war methods of sea-fighting. Old dogs, especially of the Gallic species, do not learn new tricks, as is shown by the inner history of the Paris Admiralty within the last few decades. "*La supériorité aerienne,* indeed!" England possesses half-a-dozen efficient seaplane carriers in commission, and America is conducting aerial experiments on a realistic scale and with a thoroughness worthy of the admiration of every naval student, whilst France has accomplished, as always, wonderful strides on paper, but very little as yet at sea. To squarely face the truth is the road to self-improvement; mental and verbal agitation and bold programmaking are poor substitutes for undeferred action.

Admiral Bienaimé approves the policy of England in leading the way in the matter of battleship displacement, this being the only safe course to minimize aerial and submarine dangers and to ensure superior speed on economical lines. Whereas the *Hood* steams 32 knots with 140,000 horsepower, no less than 290,000 horsepower would be necessary for propelling four ships of 10,000 tons at the same rate of going, 72,500 horsepower for each vessel; and, moreover, the superior armed and defended *Hood* could smash her four antagonists to pieces with impunity. Contrary to the prevailing opinion, the advent of the aerial and submarine dangers has strengthened, rather than otherwise, the case for large displacements.—*Naval and Military Record,* 17 August, 1921.

FRENCH NAVAL POLICY.—With regard to the naval policy of France, there appears to be considerable ambiguity as to what this policy really is. Whilst the Republic naturally remains one of the world's great sea powers, the complete change in the strategic outlook is causing her to occupy her position in this respect in rather a negative manner. As Mr. John Leyland has pointed out, current French naval policy is ruled in great measure by the dominant necessity for retrenchment.

But although this is unquestionably a very potent factor, it is not the sole determining influence. French naval opinion is very much disturbed by a conflict of views on the subject of warship design. The doubts regarding the capital ship with which we have become so familiar on this side of the Channel are even more pronounced in France. The outbreak of war found all five battleships of the *Normandie* class, provided for in the budget of 1912, in the water, but a long stage from completion. It was not until January, 1920, that President Poincaré gave his formal assent to continuation of work upon these vessels. M. Georges Leygues, the Minister of Marine, announced, however that it had been decided to abandon further progress upon these vessels.

This step was taken as a result of the conclusions arrived at by the Superior Council of the Navy. The grounds for it were that it would be

unwise to continue the construction of battleships which would prove inferior in so many respects to the ships they might be called upon to engage. The *Normandie* type are of 24,802 tons, and designed to mount twelve 13.4-inch guns, in three turrets. The last of them to be launched, the *Béarn*, is now being used as a seaplane base and barrack-ship at Toulon.

The truth is that when the late Lord Fisher openly denounced the capital ship as obsolete in consequence of the development of new conditions of sea warfare naval thought in France was moving in much the same direction. The more moderate school urged that at any rate both the subject and the circumstances warranted and allowed of exhaustive consideration. Various high-placed officers frankly advocated a reversion to the principles of the *Jeune Ecole*, which Admiral Aube defined as "*le nombre, la vitesse, l'invulnerabilité, et la spécialization.*" That the principles of the *Jeune Ecole* had been responsible for reducing the French Navy to a relatively inferior position was not overlooked. But the development of the submarine and the aircraft seemed to harmonize so completely with the doctrine laid down by Admiral Aube that it was contended that what was demonstrated as a dangerous fallacy towards the close of last century had now been rendered *fait accompli* by changed conditions.

It appears, therefore, that the disciples of number, and speed have triumphed, although how far they will attain invulnerability remains to be seen. Admiral René Daveluy, whom Mr. John Leyland terms the master mind of the French Navy, has ranged himself definitely on the side of the prophets of radical change in the methods of sea warfare. In writing upon the ship of the future he declares that the solution of the problem lies in the adoption of forms altogether different from traditional ones.

This academic form of destructive criticism has unquestionably profoundly influenced the policy of naval construction in France. No armored ships are to be built at all, but a great swarm of "mosquito" craft. The inevitable effect of this principle, if it is persevered in, must be to restrict the naval activities of France in her colonial zones. The characteristically logical reply to this is that it is useless to maintain naval activities with types of warships which would be unable to meet the vessels of other great sea powers. But such an admission is tantamount to a renunciation of all further competition in the balance of naval armaments.—*Naval and Military Record*, 14 September, 1921.

NAVAL AND AERIAL PROGRESS.—The enhanced effectiveness of the naval arm for colonial as well as for coastal warfare is once more demonstrated by the latest developments in Morocco. Where Spanish infantry had failed, the big guns of the *Espanas* told with rapid effect. This confirms the lessons of the Belgian coast, of the Black Sea, and of the Franco-British co-operation in Syria as to the fact that ballistic progress has considerably lengthened the arm of old Neptune and vastly increased his influence in land affairs. But much more is to come in this direction with the advent of mastodon seaplane-carriers, capable of unexpectedly appearing at any point off an enemy coast and of promptly extending their scouting and bombardment radius of action over a hundred miles inland, sowing destruction and panic in districts far removed from the belligerent zone, with disastrous consequences for the staying power of the enemy. Henceforth no coast is to remain immune from attack; no inland port militaire, however proof against direct bombardment by warships (as in the case of Brest, Rochefort, Bizerta, Portsmouth, Rosyth, etc.), is to be regarded as being safe against destructive attacks by seaplanes, at least so long as the enemy possesses a margin of aerial supremacy. In this respect a new chapter may be said to open in warfare; the world will next time witness true "*guerre intégrale*" with the whole of the belligerent nations sharing in the fight and in the dangers. It is to discuss and decide about the practical consequences of this totally new situation that the active Minister Guist'hau has called to Paris those experts who took a leading part in the *Prinz Eugen* and *Béarn* experiments.

Up to the present the British and American navies are the only ones possessing bona fide seaplane-carriers, and are thus in a position to carry on *la grande guerre* on the above-mentioned lines. The experiments in the *Béarn* just concluded have merely demonstrated the many difficulties that stand in the way of a thoroughly serviceable *navire porte-avions*, and which only time and patient training can overcome. The landing on board in practically all weathers of light and short scouting *Spads* and *Nieuports* is a relatively easy affair, and is being smartly carried out. Far more difficult is the problem with heavy bombers, so much so that many officers consider it probable that most of the bombers, after carrying out their mission overland, will fail to return to their mother ship and become a total loss in rough weather, which is a powerful argument in favor of the *croiseur aérien autonome* designed with a view to being at home on the waves as well as in the air and independent of any mother ship or convoyer. It is interesting to note that comparative experiments and paper calculations have led to a return to the metallic monoplane type with raised fuselage, being an improvement of the German *Dornier* boats. Experience has shown biplanes and triplanes to be unsuited to sea conditions, float and lower wing accidents being daily occurrences. But whatever strides autonome flying boats may make, the seaplane-carrier has come to stay and will constitute an important element of sea power.

There are signs that monster airships and submarines, that have long existed on paper, are coming nearer to realization. Ingénieurs Simonot, Laubeuf, and others have prepared plans for submarine "transports" of 10,000 tons and above, and the suggestion has been made that state subsidies should go towards encouraging the construction of submersible cargo boats (for which plans are ready) that would ensure in war time safe communications between France and her oversea dominions. *Jeune Ecole* partisans are waxing enthusiastic over the idea, but the failure of the so-called insubmersible *Leparmentier* boats, that were constructed in America, is a timely reminder of the danger of unmatured, imperfectly-studied innovations. France is now too poor to afford to waste time and money as she did with the 1906 Pelletan program, comprising four boats, of which the *Charles-Brun* was a total failure, and the *Mariotte* and *Bourgeois* were lame ducks, without speaking of the Bertin boats, that proved unserviceable and did so much towards depreciating the submarine in the public eye. Indeed, it pays to proceed on safe ground and to leave nothing to chance, when is considered the check which the development of any weapon receives from failure, all the more so as the obvious advantages of size have great drawbacks as a counterpart. Thus the fine British *K-5* submarine and the gigantic *R-38* dirigible came to grief mostly because they considerably exceeded the dimensions of preceding craft and required excessive care in construction and in handling—such at least is the contention of those on this side of the Channel who advocate number rather than size, oppose the taking in hand of improved copies of the Zeppelins (of which pleasing designs have been drawn both by private firms and by the section technique), and are satisfied with the 1100-ton submersible of the Guist'hau program. Exaggerated vulnerability is what they object to. Monster aeroplanes of 50 to 70 meters span, as prepared by the leading French aeronautical firms may have splendid qualities on paper and carry many tons of 400, 500, and 1000 kilo Michelin bombs, besides armor; but there remains the fact that they will be relatively slow to rise and maneuver, and therefore fall an easy prey to the ultra-rapid and marvelously handy *avions de chasse* of the *Spad* class (300 kilometers per hour). And yet an irresistible tendency in leading circles is bringing nearer the day of monster aerial and submarine craft. Aptitude to dare and run risks has ever proved for individuals and nations alike the best qualification for success. Difficulties and disasters, far from cowing down strong races, have the effect of spurring them to action. Thus it is safe to say the sad sacrifice of the aeronauts of the *R-38* has not been lost upon

go-ahead British ingenieurs and inventors, and may lead to the conquest of the aerial supremacy by England.

The French Air Secretary, M. Eynac, has just prescribed at St. Malo a *"fête aeronautique"* and an aviation display, in itself of no very great importance though interesting to note, as it shows which way the wind is blowing. In the air even more than at sea it is the human element that will tell; so in the historical roadstead of the old Breton *nid de corsaires* a dozen aviators offered the spectacle of a keen competition in bomb-dropping from various heights at changing rates of speed. Interesting results were obtained so far as accuracy is concerned, but much remained to be done in that direction. The effect of sand-filled 12- and 13-inch shells in the *Prinz Eugen* was most remarkable, but the low percentage of hits on the motionless target has been a matter for derision in naval circles, the practical value of the experiment being denied by old officers. A single shell of one ton or more will disable any mastodon provided it is dropped on the right spot; it is with a view to ensuring the realization of the latter desideratum that Minister Guist'hau has decided to introduce aerial battle practice into the navy. The new sport will, further, be encouraged by prizes offered by the great constructor Michelin and several others.

The Minister of Marine has just authorized the opening of a commercial harbor in Toulon roadstead, to the disgust of many old officers who still cling to the idea that efficiency and secrecy are synonymous terms. The development side by side of naval and commercial ports, as in England, is now seen to offer no end of advantages in the way of increased personnel and matériel resources of all sorts. Our ports *militaires* are becoming semi-commercial, even Lorient receiving the 23,000-ton British *Scynthia* and several small liners to complete or refit.

Similarly, in all French circles where efficiency and economy are appreciated there is a dead set against the monopoly enjoyed by the *arsenaux de la marine*, centers of laziness and anarchy, that immobilize no fewer than 35,000 workmen, most of them with good technical training, and are a millstone round the neck of the Marine Française, entailing the yearly waste of over 300 million francs and acting as a check upon the development of the French shipbuilding industry. With the advent of new aerial and submarine weapons, that require expert and careful workmanship, the unfitness and to a growing extent the uselessness of our huge arsenals is asserting itself in the minds of all Gallic naval students. Electoral considerations alone stand in the way of their reduction. Yet if France is to survive financially and escape bankruptcy she will have to get rid of some of her 700,000 bloodsucking parasites, and here lies the hope for the contemptors of the arsenals.—*Naval and Military Record*, 14 September, 1921.

NEW FRENCH TRAINING METHODS.—The Parliamentary vacations are drawing to a close, and this brings nearer the prospects of angry debates in the Chamber and of a possible Ministerial crisis, as deep dissatisfaction prevails as to the way in which French interests have been defended on the High Silesia question; and no wonder, since the safety of France and the possibilities of an all-around disarmament depend on the maintenance of a strong Polish State capable of preventing an anti-French (and also indirectly anti-English) coalition of Boche and Bolshevist forces. Still, confidence is felt in the tried ability of Premier Briand, and also in his well-known pro-English sentiments, to find a satisfactory issue out of the apparently inextricable situation. Meanwhile, designing, experimenting, and reorganizing are proceeding apace at Rue Royale. Indeed, splendid work has been done in all branches of the service during the last two months. "Vacations" is a blessed word in the state departments of our republic; it means methodical progress uninterrupted by ceaseless meddling on the part of good-intentioned politicians.

The Première Escadre de combat has regained Mediterranean waters after two months of visiting, feasting and banqueting in Channel and Atlantic ports, intermingled with bona-fide training in coastal navigation and combined exercises with the Brest and Cherbourg flotillas, that have received heavy reinforcements and are becoming redoubtable mosquito forces since being placed under the authority of the pugnacious Prefets Maritimes Schwerer and Barthes, who are never more happy than at sea with their pennants hoisted on board small torpedo-craft. Thus the first part is being completed of the program which the new commander-in-chief Admiral Salaun, had set himself when he assumed in July last charge of France's principal battle squadron. The second and more important part of his work he will shortly tackle in the Mediterranean, as soon as circumstances permit him to array under his flag the six 24,000-ton *Bart-Bretagnes* and the three 14,000-ton *croiseurs cuirassés* that are nominally to compose his force, together with several escadrilles of torpedo and aerial auxiliaries. Besides being the embodiment of well-directed activity, the Breton commander-in-chief belongs to the *Jeune Ecole* persuasion, priding himself on being the successor of another illustrious Breton naval man, Admiral Aube. And, as he means business, the scheme of preparation for war on novel lines, which he is going to apply this year and next, deserves to be watched with attention, all the more so as his crews, that are gradually being brought up to the full complement, have nothing left in them of the spirit of the Black Sea rebellion. Energetic weeding out, the practice of sports, and, above all, the greater percentage of Breton seamen on board, are raising anew the Flotte Française to its old standard of efficiency, without mentioning the beneficial effect of better attention to the welfare and contentment of the lower deck.

Constant sea practice, as announced by Minister Guist'hau, is, of course, to be the motto of the battle force; and gunnery, which remains the *raison d'être* of battleships, is to be carried out on new lines, as an improvement of the methods inaugurated during the war by Admiralissimo Gauchet. Turrets in all our dreadnoughts have been modified, and permit firing up to some 27,000 meters distance, which is judged to be sufficient, though our 340 mil. cannon used against the Boche have fired at over 40 kilometers. Accuracy at these extreme ranges is a matter of aerial control of stable, well-equipped flying machines, of thoroughly trained observers, and of a perfect signalling system. Whilst on paper all problems have been solved by our clever mathematicians, but little has been done in practice; and it is practice that will tell in the extreme range sport. Happily, professional interest will not be lacking, to judge from the fine preliminary preparation work conducted by the recently-constituted aviation d'escadre, that outwardly possesses the necessary elements of success.

Moreover, Admiral Salaun, who has had in the last war a comprehensive experience of operations at sea, and is, besides, a go-ahead man of progress, will not repeat the mistake of some of his predecessors, who considered the gun as their ultima ratio and their all-in-all, and, consequently, limited their field of mental activity to the study of those problems that had something to do with artillery duels at moderate range. Although the 24,000-ton *Bretagnes* might be superior ballistically to the remarkable *Dorias* of Italy, they would nevertheless represent a small and somewhat fragile asset of strength if their value were to reside solely in their guns and in their training for fleet actions in pre-war style. More is aimed at, and no wonder, as under the novel conditions of sea warfare France's power in the Mediterranean may be said to be invested mostly in the offensive radius of action of Bizerta, Oran, and Corsica points d'appui, as well as in the capabilities of the torpedo and aerial flotillas that will dot her extensive sea frontage. Six or seven battleships, even if in good fighting trim, are little in themselves, but they may become much if they can ever be assured of striking in co-operation with the adequate and well-trained coastal flotillas and supercannon batteries, if when moving across the Western

Mediterranean, at all times spanned by wireless and aerial transport communications, the admiral-in-chief can feel, at a safe distance across his van as well as abeam and in the rear, a double and impervious screen of weatherly and reliable aerial and submarine satellites, guarding against all possibilities of surprise, and giving time for tactical maneuvers and for his heavy guns to pound with some effect on an incoming enemy. This picture—it is for the present little more than a dream—while requiring time and finances, is above all a matter of will and stability at the head and of enthusiasm among subordinate officers for the hurricane-like character of the contests of to-morrow that will be a game of speed, initiative, and daring. To bring his heavy guns early and effectively into the fray is no longer to be the main preoccupation haunting the brains of French chiefs, if swifter and more decisive results can be got with less risks out of the torpedo and bomb. We are entering a new world in strategy and tactics, and efficiency will be more and more governed by the growing interdependence between sea, land, and air power; and for this reason the pioneer work M. Salaun will accomplish at the head of the *flotte de combat* cannot fail to be epoch-making in Gallic annals.

The prevailing opinion in British, and also in French, official circles that the world conflict has conclusively demonstrated the utter inability of the submarine to ever control the seas is meeting with an increasing number of objections, mostly as the result of the reaction in favor of submarining determined by recent German publications. Admiral Daveluy boldly stated that Bocheland would have won had she invested in submarines instead of in battleships, and now, even in semi-official organs, the opinion is volunteered, with the support of statistics that the Boches had actually the means of winning the war but for the meddling of politicians with the conduct of submarine warfare.—*Naval and Military Record*, 21 September, 1921.

GERMANY

FROM WAR TO TRADE.—Although the conversion of warships into merchantmen is an expedient which has little to recommend it in normal times, it has been adopted to a fairly large extent since the war. So far as we are aware, no work of this description has been done in Great Britain; but in Germany, France, the United States, and Italy quite a number of former men-of-war are now sailing under the mercantile flag. It is in Germany, where the dearth of tonnage is most acute, that this policy has been carried to its greatest length. The German merchant navy now includes ex-warships of every type, from battleships down to submarines, though the latter, needless to say, have been modified to navigate on the surface instead of below it. We recently published particulars of the tank ships *Oberschlesien* and *Ostpreussen*, which were built up by joining together the hulls of unfinished *U*-cruisers, and are propelled by oil engines originally designed for *U*-boats. Further tankers of the same type are now building in Germany. It appears also that the old coast-defense battleship *Hagen* has been reconstructed as a motor cargo ship and undergone highly satisfactory trials.

Other notable cases of this kind are the *Hertha* and *Victoria Luise*, large protected cruisers, which have been refitted as merchantmen and are now in regular service. Among naval types the destroyer would seem the least susceptible of adaptation to commercial purposes, owing to the fineness of the lines and the limited space available for cargo or passenger accommodation. Nevertheless, several big destroyers have been rebuilt in Germany as merchantmen and are proving quite satisfactory in their new rôle. The motor ship *Heisdorf*, now running between German Baltic and Russian ports, was originally one of the many destroyers laid down under the German war program but not completed before the armistice. Apparently she belongs to the so-called "1916" class, representing the largest and most powerful destroyers ever built. As reconstructed she has a

new bow section, but otherwise scarcely any change has been made in the hull. She is fitted with a 420 B. h. p. Diesel engine, driving a single screw, and develops a speed of 9 knots. This installation is so compact that the greater part of the internal space is left free for cargo, of which 1350 tons can be carried. It is of interest to learn that the former U. S. destroyer *Preble* and three sister-boats have been converted into merchantmen and are now sailing under the Nicaraguan flag.—*The Naval and Military Record*, 7 September, 1921.

INVISIBLE TORPEDOES.—One of the most important revelations made by Admiral Scheer in the special interview which has been appearing exclusively in the "*Naval and Military Record*" concerns the introduction of the so-called "trackless" torpedo. To those who are unversed in the technique of naval warfare it may seem a matter of small consequence that a torpedo has been invented to rush through the water without leaving a tell-tale wake of air bubbles. But naval men will readily appreciate the significance of this innovation. At a very early stage of the war it was found that torpedo attacks, whether made by *U*-boats or destroyers, could often be defeated by keeping a sharp look-out for the track of oncoming torpedoes and making use of the helm to evade them. The first occasion on which this occurred was during the battle of the Bight, when Beatty's battle cruisers, although repeatedly attacked by *U*-boats, managed to dodge the torpedoes by the use of the helm. In the Jutland fight our battle fleet was kept busy altering course to evade the German torpedoes, and in alluding to one such attack Admiral Jellicoe wrote that "the tracks of some of the torpedoes were seen by the observers stationed aloft, and were avoided by very skilful handling of the ships by their captains." In another place he writes: "The fact of the tracks of so many of the enemy's torpedoes being visible was a matter of great surprise to me, and I think to other officers. Reports had been prevalent that the Germans had succeeded in producing a torpedo which left little or no track on the surface."

We now know these reports to have been well-founded, but, fortunately for us, the trackless torpedo did not become a practical proposition until the close of the war. Had the Germans possessed it at Jutland and earlier engagements the torpedo danger would have been greatly aggravated, while its use by their submarines and ours would undoubtedly have increased very considerably the percentage of torpedo hits. There is, of course, nothing mysterious about the trackless torpedo. It has been evolved by substituting electric motors for the compressed-air engines formerly installed, and in this way the emission of highly compressed air through the exhaust and the consequent wake of bubbles have been done away with. The only drawback is a marked loss of speed, for the electric motor is not nearly so efficient per unit of weight as the Brotherhood engine. This handicap may be overcome sooner or later, but even as it is the elimination of the tell-tale track increases the chances of hitting to such an extent that the loss of speed is more than compensated. We may be sure that the development of the new electric torpedo is engaging the attention of all the leading navies of the world to-day.—*The Naval and Military Record*, 31 August, 1921.

GERMANY'S GROWING TONNAGE.—The remarkable progress made in the restoration of the German merchant marine since the conclusion of the armistice was recently described in the "*Deutsche Allgemeine Zeitung*," one of the Hugo Stinnes organs. Reduced from around 5,000,000 to 419,000 gross tons between the outbreak and the close of hostilities, the German merchant fleet will probably total 1,140,000 tons by the close of this year. While seven ships of 30,117 tons were completed in German yards during 1918 and none in 1919, 76 of 388,506 tons were turned out last year, which record may be surpassed in 1921.—*The Nautical Gazette*, 1 October, 1921

"BAYERN'S" MAIDEN VOYAGE.—The Hamburg-American Line's new passenger steamer *Bayern* sailed on September 15 from Hamburg to New York on her maiden voyage. The *Bayern* is the first German passenger liner to sail for the United States since 1914.—*The Nautical Gazette*, 24 September, 1921.

NEW GERMAN SAILING CRAFT SHOW UP WELL.—Convinced that the motor sailing ship is the most economical type to operate, the Krupp Germania yard at Kiel after the war constructed for its own account 40 such units ranging from 75 to 318 feet in length and from 115 to 5600 tons deadweight. These vessels are fitted with motors of sufficient power to give them a speed of 6 knots an hour. The smaller of these ships have engines of the surface ignition hot-bulb type with from one to two cylinders. The larger craft are equipped with four-cylinder marine Diesel engines of the submarine type.

Difficulties of various sorts delayed the completion of these vessels but a number of the smaller boats have been finished recently. In order to exhibit their sailing qualities the builders had them tested out in a heavy blow for the benefit of a number of experts on board of a chartered steamer. They behaved admirably and carried out all orders signalled with promptness and despatch.

The successful outcome of this test has convinced the Krupp people more than ever of the advantages of motor sailing ships. With auxiliary motors installed even quite small vessels are in a position to make long voyages without having to take aboard a large bunker and feed-water supply to the detriment of their cargo-carrying capacity. The recently imposed heavier taxation of coal and resultant increased cost of that fuel in Germany cannot but cause German shipowners to resort more to the employment of motor sailing ships. On these craft the first cost, weight and fuel consumption of their engines are very much lower than in the case of steamers of similar sizes, while their cargo-carrying capacity is greater and a smaller number of engineers have to be employed.—*The Nautical Gazette*, 24 September, 1921.

GREAT BRITAIN

A SOUTH AFRICAN NAVY.—A beginning is being made by the Union Government of South Africa with the provision of a naval force of its own. A surveying sloop and some minesweeping trawlers are being taken over, and the Admiralty have called for 27 volunteer ratings to complete their crews. These men will sign on for three years, with an option to extend the engagement by one or two years. The bulk of the crews will be obtained locally, in which connection the existence of the South African Division of the R. N. V. R., enrolled under the South African Defence Act of 1912, is a great advantage. The progress of this latest of the oversea naval forces will be watched with sympathetic interest. That the Union should go in first for surveying and mine-sweeping craft, instead of cruiser and destroyer types like Australia and Canada did, is typical of the changed conditions now as compared with pre-war days. It is only fair to point out, however, that for some time the new South African force cannot relieve the mother country. It will still be necessary to keep a squadron of the Imperial Navy at Simonstown, for, as the naval correspondent of the *Morning Post* recently pointed out, with the best will in the world the Union cannot yet awhile provide and man a seagoing naval unit capable of controlling trade routes vital to South Africa and to the empire alike. Yet the home government will apparently be deprived of the yearly contribution of £85,000 towards the cost of maintaining the Cape squadron which has been paid since 1902.—*Army and Navy Gazette*, 24 September, 1921.

NEW CAPITAL SHIPS.—Tenders for the construction of the four new British capital ships, it is expected, will be invited this month, writes a correspondent. All the shipbuilding firms in a position to carry out the contracts will be notified that they may tender. It is understood that these are to be practically the only war vessels to be built outside the Royal Dockyards for the present. At any rate, very little shipbuilding that can be carried out at the Royal Dockyards will go to private yards.—*Naval and Military Record.*

DESTROYERS: A VANISHING QUANTITY.—The Navy Estimates for 1921-22 authorize the commencement of four capital ships, one minelayer, and one submarine. No provision is made for laying down light cruisers or destroyers, and it is commonly supposed that our present reserves in both types are sufficient to meet all requirements for many a year to come. This may be true as regards light cruisers, of which we possess about 50 under ten years of age, though it should not be forgotten that only two of these vessels, *Emerald* and *Enterprise,* are equal in speed to the cruisers now building for other powers. If speed be accepted as the most important quality in light cruisers, then our position, albeit not unsatisfactory, is hardly so favorable as a mere counting of noses would indicate. And when we turn to destroyers the outlook is much less promising. It does not seem to be generally realized that a large proportion of the destroyers we had at the end of the war are no longer available. They have been scrapped wholesale, and scores of boats that nominally remain on the effective list have been allowed to deteriorate to such a degree that their reconditioning, if practicable at all, would entail almost as much expense as the building of new ones. "Fighting ships" for last year gives a total of 198 British destroyers, but we doubt whether at the present moment more than two-thirds of this number could be got ready for sea at a week's notice, irrespective of the manning difficulty.

While it would be foolish to pretend that this sweeping reduction in the size of our destroyer fleet affords ground for immediate alarm, the fact that we are well below our paper strength in a very important type of fighting ship should not be allowed to pass without remark. By the end of the year we shall have at most 150 effective destroyers, that being a liberal estimate, and as the one-Power standard has been officially adopted, no harm will be done by comparing this figure with the corresponding establishments abroad. According to the latest returns the United States Navy now contains 312 destroyers, of which 280 are less than three years old from the date of launch. Including some 40 old boats and a number of new ones not yet laid down, Japan has, or will eventually have, about 140 destroyers. The inference to be drawn from these figures is that in the course of a year or two, if nothing has been done in the interval to limit armaments by international agreement, the Admiralty may find it necessary to bring forward a new destroyer program, for the type is one that would be absolutely indispensable in any future naval campaign, no matter where or under what conditions it was waged.—*Naval and Military Record,* 14 September, 1921.

NOT ELECTRIC.—Rumor is the inevitable preliminary to a general knowledge of the design of new warships. And so, the Admiralty having announced that the specifications of the four capital ships which are to be built are "not completed," various reports regarding the wonderful features they are to embody promptly get into circulation. One of these is to the effect that electric propelling power will be employed. We may easily trace this to the fact that the United States battleships are all being fitted with electric propulsion. As usual, before this statement has well started upon its career it is chased by an authoritative denial. But rumors of this character want a lot of overtaking.

The fact is that naval engineers on this side of the Atlantic remain unimpressed by the merits of electric propulsion for big warships. That well-known specialist, Mr. Alexander Richardson, M. P., in discussing the performances of the *New Mexico*, says there are many incidental disadvantages to the system of electrical transmission between the turbine and the propeller. The *New Mexico* has two turbo-electric generating sets of 11,400 kilowatt capacity. These have no mechanical connection whatever with the propeller shafts. The electric power is transmitted to motors of 6600 nominal horse power, one on each of the four propelling shafts, the motors being close to the stern of the ship.

These are reversible motors, so that there are not, as in the ordinary turbine mechanical transmission system, separate turbines for going astern. During trials the *New Mexico* developed 3197 horse power more than specified in the designs, and averaged 21.08 knots for six hours. This increased power, however, was not due to electric transmission, but to the fact that, with oil fuel and steam turbines, overloads can easily be maintained for long periods. Where the real gain of the system comes in is that when running at a fraction of the full power it is only necessary to put into operation one or more turbo-electric generating units to supply the electricity to the motors. Therefore the turbo-electric generating unit can be worked at nearly full power, and consequently be made to yield maximum efficiency.—*Naval and Military Record.*

POINTS OF CONTENTION.—The advocates of electric propulsion maintain that the ability to use the full motive power of the ship in going astern is of great tactical value. The answer to this, however, is that the limit to the power of going astern in a turbine ship is determined by the danger of cavitation, which is likely to give trouble in high-speed vessels if, on reversing from full-ahead to full-astern, the power transmitted suddenly exceeds about 50 per cent of the full-ahead power.

At Jutland electric gear of every kind gave trouble. Under the shock of heavy gunfire switches were thrown out and circuits broken. On the other hand, mechanical and hydraulic installations maintained their functions under these conditions. The high turbine efficiency claimed for the electric drive at cruising, or economic, speeds is discounted for two reasons. First of all, the advantage is small to the point almost of negligibility when the most approved arrangement of cruising turbines is fitted to a gear-driven vessel, and, secondly, the loss of power with electric transmission is higher than with geared turbines.—*Naval and Military Record,* 17 August, 1921.

BATTLE-CRUISERS.—When the *Tiger* reduces to two-thirds complement at Devonport at the end of the present month there will not remain a single battle-cruiser of the Jutland era with the full commissioned fleet. Sir Walter Cowan's command will still consist of two ships only, the *Hood* and *Repulse,* for although the *Renown* nominally belongs to the battle-cruiser squadron, the "particular service" for which she is detached will keep her away from it for at least nine months.

Of course, the battle-cruisers which are being maintained at three-fifths complement in reserve are practically as available, should they be suddenly required at any time, as though they were in full commission. It has been suggested that the ships of the *Lion* group might well be adapted to burn oil fuel only. But it is very doubtful whether the Admiralty are prepared to sanction a big expenditure upon any vessels of the 13.5-inch-gun type. The *Hood, Repulse,* and *Renown* are, of course, all armed with the 15-inch weapon, and therefore thus far remain the "last word" in smashing power.—*Naval and Military Record,* 14 September, 1921.

THE "CAT" SQUADRON.—Whether they are modernized or not, the *Lion*, *Tiger*, and *Princess Royal* are bound to remain a valuable trio of first-line ships for a considerable time to come. They possess the qualities of very high speed, wide sea-keeping radius, and good protection, whilst their armament still remains very formidable, even when compared with the latest developments in naval artillery. No doubt they will be completely outclassed by the four capital ships it has been decided to lay down. But, then, if we are going to discard our fighting ships as fast as they are improved upon, our navy will become reduced to the last completed batch of the latest class.

The fact is that obsolescence travels in very uneven cycles. Jutland proved our capital ships to be adequate to anything in the way of gun power, but unsuspectedly defective in protective qualities. This means that ships have been condemned not because they were not still capable of putting up a staggering attack, but because they were weak in their defence. It should be quite feasible to reconstruct these ships on the same principle as in the case of the *Repulse*. But here again arises the consideration of worth while, for would the relative value which the *Lion* type would bear to the latest design, after reconstruction, justify the heavy expenditure involved? The *Repulse* is a 15-inch-gunned ship, so the question does not apply to her in anything like the same degree.—*Naval and Military Record*, 14 September, 1921.

POST-JUTLAND BATTLESHIPS.—The launch of the American battleship *Washington* on September 1 has brought the number of post-Jutland capital ships now afloat up to five, of which three are owned by the United States and two by Japan. Although often labelled as such, the *Hood* is not really a post-Jutland ship, for her designs were completed several months before the battle, and the modifications introduced subsequently did not and could not embody all the experience derived from that action. But the *Washington* and her two sisters previously launched, viz., *Maryland* and *Colorado*, were planned long after Jutland, as also were the Japanese ships *Nagato* and *Mutsu*, so that all five vessels are credited by naval authorities with a very much higher degree of tactical efficiency than that possessed by the most powerful ship laid down in the pre-Jutland era.

At least three years must elapse ere the British Navy includes any capital ships equal in armament and protection to the *Washington* or the *Nagato*, and by that time both the American and the Japanese navies will have been reinforced by several more ships of greatly increased dimensions and power. The *Washington* belongs to the "*Maryland*" class, the fourth unit of which, the *West Virginia*, is still on the stocks. Her length over all is 624 feet; breadth, 97 feet 3½ inches; the displacement at full load being 33,590 tons. She will be propelled by turbines with electrical transmission, designed for 28,900 horsepower, and a speed of 21 knots. Her main armament consist of eight 16-inch 45-caliber guns in four turrets, discharging projectiles of 2100 pounds. She will carry in addition fourteen 5-inch q. f., four 3-inch A. A. guns and two torpedo-tubes. In the latest American battleship type, now building, the displacement has been increased to 43,200 tons, the armament to twelve 16-inch 50-caliber guns, and the speed to 23 knots.—*Naval and Military Record*, 7 September, 1921.

MINELAYING VESSELS.—It appears from a reply to a question in Parliament, just before the adjournment, that the new minelayer which is to be built at Devonport is likely to make quicker progress than either the experimental submarine at Chatham, or the capital ships in the private yards. Mr. Amery stated that the boilers for the vessel are already available, as well as portions of the main machinery and the accessory auxiliary machinery. This is all to the good, as it must always be a desirable thing, once a new design has been approved, to translate it into practical shape at the earliest moment. So many excellent designs in the past have, owing

to slow construction, been rendered out of date before they could be tested in service by the ships for which they were adopted. In the case of the new minelayer she is an entirely new departure. All our minelaying vessels hitherto have been converted cruisers, ex-merchantmen, or ordinary fighting craft like destroyers and submarines temporarily diverted from their original purposes. The new ship will be the first to be designed and built for the primary duty of laying mines. As to the object in building her, anyone who gives a thought to the matter must realize that minelaying in the next war will be vastly different to that in the last, when the distances to the places to be mined were so small. Where vessels were then able to make a run of a hundred miles, lay their mines and return, in future they may be required to travel a thousand miles to perform the same operation. Even if they could go so far, it would be ridiculous to use for such an undertaking vessels like the *Paris*, carrying only 79 mines, or destroyers, carrying 40 mines each, or trawlers, carrying 25 mines, such as Admiral Bacon tells us he had to be content with in the Dover patrol.

If we turn to our present position in regard to minelaying vessels, it will be found that the war left us with none which is likely to be of future service, with the possible exception of the *Princess Margaret*. In August, 1914, there were in commission the seven ex-cruisers of the *Apollo* type, which had been fitted to lay mines, but they proved too slow to be of much use. Until November, 1914, we laid no mines whatever, and the minelayer squadron attached to the Grand fleet was utilized instead to assist the hard-worked cruiser patrols. In 1915, however, a different state of things prevailed, and the Admiralty chartered the Canadian Pacific liners *Princess Irene* and *Princess Margaret* for conversion into minelayers, of which the former was unfortunately blown up in Sheerness Harbor on May 27, 1915. The *Princess Margaret* was, however, employed in the North Sea, the Dover Straits and elsewhere during the war, and in 1919 was attached to Rear Admiral Cowan's force in the Baltic. On her return she was paid off on January 20, 1920, and is now in charge of a care and maintenance party at Portsmouth.

The experience gained in the war will naturally be taken advantage of in the design of the new vessel, even though she is likely to be very different to anything then used. When the Americans came across the Atlantic to assist in laying the northern barrage, they were able to rely chiefly on small craft because they had the advantage of a friendly base in the neighborhood. This may not be the case with us in a future war, and we may therefore have to depend entirely on the capacity and enduring mobility of our minelayers, just as the Germans were entirely dependent upon fast vessels like the *Meteor*, which made a minelaying raid into the Moray Firth in August, 1915, when the destroyer *Lynx* was blown up. The casual strewing of mines by German submarines and vessels under neutral flags as far overseas as the Cape is in a different category, but the difficulties they had to encounter shows the need of a properly equipped mining vessel which can either lay a field herself or act as a depot-ship for minelaying submarines operating in hostile waters.—*Army and Navy Gazette*, 10 September, 1921.

TURBO-ELECTRIC PROPULSION.—The rumor that one of the four new battle-cruisers of this year's naval program is to be fitted with a turbo-electric system of propulsion still persists, though it is very difficult to imagine on what grounds it does so. The turbo-electric is a system of transmission for marine purposes that has been received with little favor in this country. Whether because marine engineers are not usually expert electricians—and, if so, it is really mere prejudice—or whether as the result of a careful consideration of its merits compared with those of mechanically geared turbine installations, the fact remains that attempts to introduce it into Great Britain have hitherto signally failed. There is

therefore available here very little actual experience on the subject beyond what may be gathered from foreign sources. As a result of comparative trials made on three 12,000-ton colliers fitted respectively with twin screws, driven by reciprocating engines, geared turbines, and turbo-electric machinery, the United States Navy Department fitted electric driving to the battleships of the *New Mexico* and *Tennessee* class, and has adopted it for the new battleships and battle-cruisers now under construction. With these remarkable exceptions, vessels fitted with this type of machinery are very scarce indeed.

The progressive nature of the Admiralty Engineering Department towards all developments which offer promise of success is well known, but it is hardly likely to lead the Department to make its first experimental installation on a scale more than twice that of any British power station. In fact, very few stations in the world contain a plant capable of a steady output of 125,000 kilowatts, which is what the new installations represent. That in the *New Mexico* was 24,000 kilowatts. The history of United States battleship machinery since their first dreadnought *Delaware* was constructed has hardly been consistent. We have seen reciprocating engines, twin-screw direct-connected turbines, four-shaft turbine installations, more four-shaft installations, a reversion to reciprocating engines, then another twin-screw turbine and a reciprocating engine, then partially geared turbines and the electric drive follow one another year by year, and the last step was determined on while the latest battleship was fitted with piston engines. The all-geared installation has not been tried in United States battleships. There is no doubt that the United States Navy Department exhibited extraordinary boldness in passing directly from the *New Mexico* type to battleships of 60,000 and cruisers of 180,000 shaft horsepower. The latter are to be propelled by four shafts and the application of motors of 45,000 horsepower to each will be a very noteworthy feat. In the *New Mexico*, the shaft revolutions were brought down to 165 at 21 knots, which enabled very efficient propellers to be adopted. The *Hood's* revolutions were 210 for 32 knots, and anything much less for transmitting those enormous powers is likely to lead to difficulty in the manufacture of the shafting, the tail shafts for the latter being no less than 28½ inches in diameter, so that with electric driving other conditions than the motor affect the speed of rotation. The general claim made for the advantage of electric driving is that (a) the turbine speed is independent of the propeller shaft; (b) one generator can be run, for low powers, at nearly its full capacity and drive all the motors, the full capacity rendering it more economical than four separate units each running at a quarter of the power which is being developed; and (c) there is no astern turbine. It is very difficult to get marine engineers in this country to admit the advantage of any one of these points. With mechanical gearing, the turbine speed can be made almost anything desired, and with turbines driving generators, it is the construction of the generator which often controls the turbine speed. The highest turbine speed which can be used depends on the necessary area through the low-pressure blading for the desired vacua and blade efficiency, in association with the strength of blade and centrifugal stress. It may be necessary to reduce the revolutions when the power is high in order to increase the area for steam to pass through the blades without unduly increasing its velocity. This condition is frequently met with nowadays in destroyers and cruisers, and when a design approaches it there is no more to be gained from the economical point of view by putting up the revolutions. If anything, the geared installation has an advantage in this respect over the electrical drive. The latter must rotate at revolutions which suit the number of cycles employed; the former may run at any odd number. As regards (b), owing to the power being so high for the speed, neither turbine has any advantage over the other as regards full power economy, and while one turbine generator, run at nearly full power for, say, quarter-power, will

be more economical than four units each run at one-sixteenth, there is no gainsaying that when both generator and motor efficiencies are considered the difference will be materially reduced. As regards point (c), that there is no astern turbine, this is merely a small matter. With gearing, no trouble accrues from the small size of astern turbine now fitted. Against these claims there are some formidable disadvantages. First of all, the combined motor and generator efficiency at full power is materially less than that of reduction gearing. Secondly, as the turbines will be practically identical, because they will each be run at practically the maximum revolutions, and piping and condensing plants are similar, we have, in one case, the gear wheel, pinions and casing, and in the other, generator, motors and switchboard and wiring to contend with, and the weight of the latter is obviously far more than that of the former. Thirdly, as regards the astern turbine, the motors and switchboards must contain corresponding complexity to enable reversal to be effected. Summarized, we might say that turbo-electric propulsion in the eyes of British marine engineers offers three salient disadvantages: (a) Lower economy at all except very low powers; (b) considerably greater weight; and (c) more complexity by the full extent of the whole system of electrical control, the steam element remaining practically as before.

For these reasons in general, without entering into many minor points, it is most unlikely that the Admiralty advisers would commit themselves to an experiment on a colossal scale. We invariably hesitate to criticize a system which is endeavoring to fight its way, and least of all on hearsay evidence. But we admit that prior to being willing to support the Admiralty Engineering Department in an experiment on turbo-electric propulsion on even the scale of a light cruiser, we should like to know a great deal more about the performance of the *New Mexico* and *Tennessee* than has hitherto appeared. Experience of small merchant vessels with this class of machinery has been anything but satisfactory in some cases, though a number of vessels in the United States are to be fitted with it. We shall look to the future development of the type with much interest.—*The Engineer*, 9 September, 1921.

SUBMARINE LIFTING.—Some very interesting experiments have lately been carried out in the Albert Dock with an immense magnet which, it is claimed, will prove of great value in raising submarines that cannot recover their buoyancy sufficiently to come up again. Charged with electricity this magnet is said to be capable of raising up to 15 tons, and during the course of the demonstration brought up an iron body weighing 2½ tons from five fathoms of water.

It is, of course, possible that submarine mishaps might occur in which salvage operations would be quite feasible by the use of such a magnet. But as a rule the cause which leads to loss of reserve buoyancy results in complete flooding. The submarine then becomes a sheer dead-weight of several hundreds of tons. If it is only necessary to employ a lifting force representing a few tons to recover a sunken submersible, probably divers and slings would prove quite as prompt and even more effective than plumbing with a magnet. The idea is one which should prove of great utility in many directions, but we scarcely imagine that the recovery of submarines is likely to be one of these.—*Naval and Military Record*, 7 September, 1921.

ROLLING OF WARSHIPS.—It is understood that experiments are being carried out with a new form of gyroscopic equipment, with a view to minimizing the rolling of ships in a seaway, and that if the results are considered satisfactory the idea is likely to be generally adopted in the navy. The gunnery people will be particularly interested in these tests.

since steadiness of platform is one of the chief factors in efficiency of shooting.—*Naval and Military Record*, 31 August, 1921.

BRITISH HELICOPTER.—Tests with the Brennan helicopter—the new type of flying machine for rising straight into the air—are progressing satisfactorily at Farnborough, but until the experiments are completed the work will be confidential.

It will not be easy to maintain privacy when the helicopter takes the air in more ambitious flight, as it is expected to do very shortly, but for practical purposes open-air flights will probably be tried in the twilight hours.

A point of special interest is the superiority of the British type over designs favored elsewhere. It promises a notable innovation in aviation, alike for military and civil purposes. For instance, a ship mothering aeroplanes will no longer need to be equipped with cumbrous reaches of decking, as a modest area will suffice for the helicopter.

When space can be similarly economized in land stations, the prospect opens of the helicopter's invasion into the busiest of populous centers—making it as easy to take as train or tram.—*Naval and Military Record.*

FIVE LIVES LOST IN DISMANTLING OF "DEUTSCHLAND."—A disastrous explosion occurred in the ex-German submarine *Deutschland* on Saturday at Birkenhead Yard, where the vessel was being dismantled. Three 17-year-old apprentices were killed at once and two others succumbed to injuries later in the day. The cause of the explosion is a mystery.

The *Deutschland* was the big German *U*-boat which made the voyage to Baltimore in June, 1916, under the command of Capt. Paul König. She carried a cargo of precious stones, dyes, and patent medicines to German firms in the United States. Following upon this trip she took part in unrestricted submarine warfare, and after the armistice was handed over to Great Britain.—*Naval and Military Record*, 14 September, 1921.

ENGLISH ADMIRALS TO EARN THEIR SALT.—The British reserve fleet is about to be reorganized in such a fashion that its "admirals will earn their money." As at present constituted the reserve fleet consists of only a few light cruisers and destroyers, and yet it has one vice admiral and four rear admirals. Moreover, it is scattered among the home dockyard ports, at which there already is an admiral who is a naval commander-in-chief and an admiral superintendent of the dockyard, so at each port there are three officers of admiral's rank.

To correct that abuse, in the future there will be only one admiral commanding the reserve fleet. The other admirals will be assigned to the active Atlantic fleet for training. They are to go through a war course, a course of weapon technic, a submarine and anti-submarine school, an air-force school of co-operation with the navy, and, finally, three months' active duty with the Atlantic fleet. The three months will be divided among various portions of the fleet: a fortnight each with battle cruisers and light cruisers, a week with the rear admiral of destroyers, a week with the senior officer of submarines, a week on board a fleet aircraft carrier and a month on the fleet flagship.

When with the cruisers the reserve admirals will be permitted to handle them in tactical maneuvers, and toward the end of the month on the fleet flagship they are to maneuver the whole Atlantic fleet for two days each. At the close of their training, the commander-in-chief of the Atlantic fleet is to communicate confidentially to the Admiralty his opinion of their capabilities as fighting commanders. A brief comment is that at the close of those courses "the country will get full value for its money."—*Philadelphia Public Ledger*, 10 October, 1921.

NORMAL CONDITIONS RESTORED AROUND BRITISH ISLES.—The Admiralty announces that the work of clearing the Heligoland Bight minefield has now been successfully accomplished by the Germans. This marks a definite stage in the work of restoring the seas to normal conditions since the entire North Sea is thus rendered clear of moored mines. The waters surrounding the British Isles are now entirely cleared. The Mediterranean Sea is practically cleared, only three small areas on the Albanian coast remaining, the clearing of which should be completed this year.

Four small areas remain in the Arctic, for which Germany is responsible, and a German mine-sweeping flotilla is at present at work there, but in all probability ice has affected their clearance during the last four winters. In the Baltic mines still exist between latitudes 56.30 N. and 60.30 N. to the eastward of 17.30 E., and here mine clearance is in progress. In the Adriatic the three small areas still to be swept will be cleared in the near future, one by Italy and two by Yugo-Slavia.

With one exception, the fields enumerated above constitute the only areas which now remain to be made safe for shipping. The one exception is the Black Sea. Here are still numerous minefields. No international agreement exists for their removal, and the region is now in a far worse condition than when the British mine-sweeping forces withdrew, more mines having been laid by the Russians.

This work of clearing the seas has been carried out under the ægis of the International Mine Clearance Committee, brought into existence as a result of the Allied Naval Conference on clearing the seas of mines after the war. During war time seaborne trade was regulated by the convoy and other systems, but on the arrival of peace no such restrictions could be imposed, and shipping had to be warned of the existing dangers and of the changes as they occurred.

The committee's mine warnings obtained a worldwide reputation. Not one report has been received of a vessel striking a moored mine while obeying the committee's instructions. Considering the vast tonnage afloat and the enormous aggregate mileage covered, it is remarkable that accidents have been so few, and where these have occurred it has in all cases been proved that the casualty was directly caused by a breach of the instructions.—*Naval and Military Record*, 14 September, 1921.

BRITISH AND GERMAN SHIPYARD ACTIVITIES CONTRASTED.—In a series of articles entitled Germany on the Seas, the London *Daily Telegraph* asserts that before the war only 25,000 men were employed in German yards as compared with 100,000 in May last. Of these 70,000 were working on vessels which were to be paid for out of the funds voted by the German Government to replace ships lost by the terms of the Versailles peace treaty.

Deliveries by the yards to German firms began on a large scale only during the present year. In the first quarter of 1921 the Hamburg yards completed eight steamers of 36,000 tons, while in the succeeding quarter the output rose to 16 vessels aggregating 106,000 tons. At present 64 steamers of 300,000 tons deadweight are on hand on the Elbe alone. Eighteen of these are for the Hamburg-American Line, while 5 are to be constructed for foreign owners.

"While the shipyards of the Clyde and Tyne are deserted and silent," continues the *Telegraph*, "those of the Elbe are teeming with busy men and ringing from morning till night with the rattle of the pneumatic riveter. While ten to fifteen million tons of Allied and neutral cargo space lie rusting in the back waters, Germany is not merely building new ships as fast as she can, but is also buying back many of those she was compelled by the Versailles Treaty to surrender."—*Scientific American*.

ECONOMIC CONDITION OF BRITISH SHIPBUILDING.—What may well be taken as a direct reflection of the general state of affairs in the shipbuilding industry is the announcement which Messrs. Yarrow and Co., Ltd., of Scotstoun, on the Clyde, have recently made to their workmen and sent to the press. They intimate that they have decided to temporarily close their works, with the exception of the experimental and research department, on or about November 30, and will reopen when conditions enable business to be carried on with some chance of success. They state that owing to repeated strikes, reduction of output, and demarcation disputes which have taken place in various industries throughout the country, the cost of shipbuilding has become excessive; in addition to which it is impossible to promise dates of delivery. As an illustration both of shipbuilding difficulties and their reluctance to close down, the firm states that a recent offer which they made for a British steamer, an offer involving about £25,000, which would have left them no profit, and which turned out to have been the lowest in this country, was underbid by a Dutch firm to the extent of £6000. Another instance of the same kind, although experienced by another firm, may here be referred to. Messrs. Rennie, Ritchie and Newport Shipbuilding Co., who operate several yards throughout the kingdom recently lost an order for 50 barges owing to a Dutch firm cutting in at one-third less their price, and in a way which throws a striking light on the manner in which the British labor troubles are sending work abroad. The order for these 50 barges for South America had actually been placed with the firm, and the contract was on the point of being signed. As the barges, however, had to be delivered through Antwerp, enquiries were being made in that port. In this way a firm in Antwerp got wind of the business, and they applied direct to the principals, offering to build the vessels at one-third less than the English firm. This was accepted, and forthwith the Antwerp firm handed the order over to Holland builders and got 10 per cent on the business. Such facts as these (and they are by no means isolated) are convincing evidence of the deplorable condition of affairs which have for a considerable time operated against the British builders securing orders, and whose continuance is now causing firms to close their works. This is the second Clyde shipyard which the adverse state of affairs has so seriously affected. Some little time ago the Lloyd Royal Belge Co., at Whiteinch, practically closed their works, owing to the inability of the shipowning concern, the Lloyd Royal Belge Co., of Antwerp—who were operating the yard chiefly on their own account—to continue building at a great loss, tonnage they were finding could be produced at reasonable cost in Antwerp. While the case of Messrs. Yarrow—who have renown and experience chiefly in types of ships other than plain merchant vessels—may be thought to be exceptional, there is abundance of other striking evidence of the pass to which the general state of shipbuilding has now come. The slump in shipbuilding contracts, and the delays in the completion of work actually on hand, alike point to this. While costs of shipbuilding material have certainly fallen somewhat since the end of the coal strike, and the supply and price of coal has become more normal, there are still other factors which contribute to the perpetuation of the depression and the increase of the unemployed. Wages in every branch must be lowered considerably before any tangible revival can be hoped for, especially considering the low volume of world's trade, and the superabundance of existing shipping tonnage to deal with it. It must surely be recognized by all workers that it is better to be employed at such remuneration as industry can really afford, and thrive upon, than to employ a small number and leave the great masses of workmen idle. Happily, we now have the welcome news of the shipyard joiners having accepted modified terms in connection with the 12s. per week deduction, against which the joiners have struck for nearly nine months past. There is also strong hope of the proposed reduction of 12½ per cent on the wages of the engineering

trades being accepted shortly. Unless these and other modifications in wages are made, unemployment, which has affected at least 40 per cent of the ship building workers for too long a period already, will be prolonged and aggravated. The new and reconditioning of work that has offered of late has, because of the prevailing state of things, been diverted to other countries, where wages and other conditions are normal and more favorable. Unless British workers can content themselves with less wages there will be less and less work for British ship yards and their closing down will occur, not in single cases only, but in groups.—*The Marine Engineer and Naval Architect*, September, 1921.

THE WHITE STAR "MAJESTIC."—The White Star Line quadruple-screw steamship *Majestic*, 56,000 tons, now nearing completion, will be the largest vessel in the world, and, by reason of the altered economic conditions consequent upon the war, will doubtless be the last word in mercantile shipping for some time to come. A recital of the dimensions of this vast steamer, and a few particulars of her principal features should testify to the outstanding position the *Majestic* will hold in the world's commercial marine when, as is anticipated, she takes her place in the White Star Line's mail and passenger service between Southampton, Cherbourg and New York next spring.

With a length over all of 956 ft., a height from keel to boat deck of 102 ft., and a breadth of over 100 ft., the *Majestic* will have a gross tonnage of about 56,000, and a displacement of 64,000 tons when loaded to her marks. The turbine machinery will develop a maximum of 100,000 horse power, and it is intended that the *Majestic* shall have an ample reserve to steam an average of 23 knots per hour at sea—*Marine Engineer and Naval Architect*, September, 1921.

JAPAN

SUPER-SUBMARINES.—A sensational story comes from New York about the "giant" submarine which Japan is said to be laying down. The well-known Sulzer firm of Winterthur, Switzerland, which specializes in Diesel-motor manufacture, is reported to have received an order from the Japanese Government for several sets of submarine engines, each set to consist of three or four units developing collectively from 16,000 to 20,000 horsepower. If this news is authentic, it means that the Japanese under-water craft will be larger and faster than any that have been built up to now. The fastest submarines in the world are those of our *K* class, steam-driven on the surface, with a speed of 24 knots, these turbines developing 10,000 horsepower. Next in point of speed, so far as British submarines are concerned, are the *J* boats now in Australia, with Diesel engines of 3600 horsepower, giving a speed of 19 knots. America is building nine "fleet submarines" of large displacement, which are reported to be equipped with motors of 8000 to 10,000 horsepower.

All these figures, however, are cast into the shade by the Diesel installations which Japan is said to have ordered from the Sulzer firm. The Japanese naval authorities are known to have been much impressed with the ex-German submarines that fell to their lot, and there have long been rumors that a Japanese edition of the *U*-cruisers type is building. That submarines of 3000 tons or thereabouts, with a high surface speed, great cruising endurance, and good accommodation for the personnel would be extraordinarily useful for war service in the vast wastes of the Pacific Ocean goes without saying. Even as it is, the Japanese Navy has built submarines of much larger dimensions than those with which they are credited in the naval text-books. Although the latest New York story may not be entirely accurate, it is within the bounds of possibility that the power which owns, for the moment, the largest battleship afloat has decided

to take the lead in introducing submarines designed on the same grandiose scale.—*Naval and Military Record*, 17 August, 1921.

JAPANESE NAVY'S FUEL SUPPLY SHIP ON WAYS.—In the presence of a number of Japanese naval officers and officials of the United States Navy, the keel of the fuel supply ship *Kamoi* for the Japanese Navy was laid at the plant of the New York Shipbuilding Corporation at Camden, N. J. Named for a mountain in the province of Hidakia, Japan, meaning "dignity of God," the *Kamoi* will be 500 feet long and have a deadweight tonnage of 13,000 tons. The contract calls for a speed of 15 knots an hour.—*The Nautical Gazette*, 24 September, 1921.

JAPANESE AIRPORT.—Japanese aviation authorities, it is announced, are making preparations for the establishment of an aerial port near Tokyo. This port is intended to be the first of many airdromes to be constructed in Japan, Korea, Saghalien, etc. It is to comprise a training ground, landing place, warehouses, customs house, hospital, wireless installations, a signal tower, etc., also equipment for night flying. The fact that this air port will be placed under the control of the Imperial Japanese Aviation Bureau will serve to make it an important military asset in time of war.—*Aviation*, 3 October, 1921.

PACIFIC STRATEGY.—Some three weeks ago, before Japan had formally signified her acceptance of the American invitation to confer on the subject of armaments, it was reported from Tokyo that the Imperial Government was then considering a proposal which originated with the Japanese naval authorities, having in view the non-fortification of island zones and a declaration of the freedom of the Pacific. This proposal, the message added, was to be forwarded to Washington with a view to its being placed on the agenda for the conference. As nothing further has been heard of the suggestion up to now, it may have been dropped. In any case it is very unlikely that America would have approved a plan so obviously disadvantageous to herself. The effect of such an agreement would to deny to the United States the right of providing secure bases for her fleet in the Western Pacific, and would consequently close that area to the American Navy for all practical purposes.—*Naval and Military Record*, 17 August, 1921.

JAPANESE NAVAL MANEUVERS.—A fortnight hence will see the Japanese naval maneuvers in full swing. This year's exercises are said to be planned on a larger scale than any which have been held up to now, and will surpass those of October, 1919, as regards the number of ships participating. According to a detailed account just published in the *New York Herald*, the principal maneuver zone will be the Sea of Japan, though the operations will also extend to the open waters of the Pacific. The leading rôle has been assigned to the 1st and 2d fleets, based on Yokosuka and Kure respectively, but the 3d fleet, with its headquarters at Sasebo, will also take part. Irrespective of small craft and auxiliaries, upwards of 40 ships are to be commissioned for the maneuvers. They will include 12 dreadnoughts and battle cruisers, some of the older armored ships, and a large force of light cruisers. Destroyers, submarines, and aircraft will be well represented. The maneuver fleet will be headed by the battleship *Nagato*, flying the flag of Admiral Tochinai.

Early in September the 1st and 2d fleets are to rendezvous at Saiki Bay, in the Bungo Strait, between the islands of Kyushu and Shikoku. For a week or more this combined force will carry out tactical exercises and various practices under the supreme command of Admiral Tochinai. The second phase will begin on September 12, when the force will be split into

two fleets—one representing the Japanese battle fleet and the other an "enemy" squadron bent on forcing its way into the Japan Sea through the Korean and Tsushima Straits. Admiral Shimamura, chief of the naval staff, will probably embark in the *Nagato* to observe the proceedings. The object of the tactical plan is to determine whether the Japanese fleet is strong enough to carry out the dual task of guarding the Pacific coastline from attack and simultaneously holding the approaches to the Sea of Japan. Interest will center mainly round the defence of the Korean and Tsushima Straits, for the problem before the defending fleet is a magnified version of that which confronted the British naval authorities at Dover during the war.

It is true that the islands of Tsushima and Iki, situated midway between the coasts of Korea and Japan, are heavily fortified, and could do much to hinder the passage of enemy surface ships during daylight. But the channel on either side is from 30 to 40 miles wide, so that hostile submarines would have a good chance of getting through unmolested. Nevertheless, the Japanese are endeavoring to make this passage inaccessible to submarines, for they are well aware of the danger that would menace their communications with the mainland were enemy boats able to penetrate into the Sea of Japan. A considerable part of the Japanese air fleet is to be mobilized for the maneuvers, and it is expected that 80 machines will be in service. Two years ago a series of "raids" took place on the principal coast towns, and the object lesson proved so effective that public opinion demanded the speedy reinforcement of the air fleet.

It appears that at the close of each maneuver period the results are investigated by a commission of admirals and staff officers, who award praise or censure in accordance with their findings and permit no personal considerations to influence their judgment. "'Efficiency,' says the *Herald*, "is the sole standard by which officers are measured, whether their rank be high or low. The Emperor of Japan never meddles in technical matters. In this he is unlike the ex-German Kaiser, who, although innocent of practical knowledge, never hesitated to pronounce final judgment on the most complex problems of sea strategy."—*Naval and Military Record*, 31 August, 1921.

JAPANESE NAVAL POLICY.—According to the Osaka journal *Mainichi*, the Japanese defence program in the Pacific is steadily advancing towards completion. It involves not merely the expansion of the fleet on the lines of the well-known "eight-eight" scheme, but the building of fortifications and bases at various points that would possess high strategic importance in the case of a naval campaign in the Pacific. During the current year strong batteries have been erected at the Bonin Islands, which are situated some 500 miles south of Yokohama. These islands had hitherto been undefended, and there were no special facilities for the accommodation of warships. A portion of the press criticizes the government for spending money on the fortification of the Bonins, but from the strategical point of view this measure was undoubtedly justified. Had they remained defenceless they would have been liable to seizure by a fleet operating against Japan. The islands have been Japanese territory for 60 years, and would no doubt have been fortified long ago but for the fact that only within comparatively recent times has Japan found it expedient to devote serious attention to her naval frontiers facing the Pacific, instead of contenting herself with the attainment of absolute supremacy in the Sea of Japan, the Yellow Sea, and the East China Sea. The Bonins, it should be noted, are on the direct route between Yokosuka, one of the principal naval bases, and the Mariana Islands, the southernmost island of which is Guam, the only American naval station in the South Seas. Thus Japan, without violating the terms of the mandate under which she occupies the former German islands of the Mariana group, and which inhibits her from putting them to military

use, has nevertheless contrived to establish a strong *point d'appui* within 750 miles of Guam.

Fortifications are also in course of construction on several islands of the Luchu archipelago. which extended between Formosa and the southern coast of Japan (Kyushu). Batteries have ben mounted at Amami, Oshima, and Yajima. In view of their geographical position these works must be regarded as purely defensive in character. Miyake Shima, an island off Idzu Province, lying 100 miles due south of Yokosuka, is to be provided with a naval signalling station and an aerodrome. These and similar measures—including the conversion into a second class naval base of Mako, in the Pescadores Channel—reported to be in contemplation, indicate a desire on the part of Japanese strategists to leave undone nothing which is calculated to make Japan and her outlying possessions secure from attack. Foreigners may be at a loss to understand the motive of all these preparations against an invisible enemy, but the Japanese evidently think them necessary or they would not be spending large sums on defensive works at a time when money is notoriously short.

The large flotilla leader *Yukaze* (*Evening Wind*) was launched on May 28 at the Nagasaki yard of the Mitsubishi Co. in the presence of Admiral Takarabe, commander-in-chief of the Sasebo naval station, who named the vessel. Belonging to a group of eight leaders authorized in 1920, the *Yukaze* is a representative of the largest and most powerful type of Japanese torpedo craft. The papers describe her as a "torpedo cruiser" of 2000 tons, 36 knots speed, with an armament of 4.7-inch guns. It is feared that the construction of many warships, from battleships to submarines, now in hand at the Kawasaki and Mitsubishi yard in Kobe will be delayed by the labor troubles that broke out in that city a few weeks ago. Practically all the workmen at both yards downed tools, and their attitude became so threatening that troops and gendarmes were called in to guard warships lying on the stocks and in the fitting-out basins. Naval officers hurriedly despatched from Tokyo made eloquent appeals to the strikers to abstain from committing any act of sabotage against the warships, and these appear to have been successful, for no damage to the vessels is reported.

As a counterblast to Mr. Ozaki's speech-making tour in favor of a reduction of armaments, the Imperial Marine Association—a society formed in 1900 for the promotion of Japanese maritime interests—has decided to embark on an intensive publicity campaign to popularize the navy among all classes of the nation. For this purpose a special naval committee has been appointed, under the presidency of Prince Higashi-Fushimi, with the title of "Kaibo Kyokai" (Naval Defence Association), to arrange lectures and kinema displays on naval subjects, especially in inland districts, where knowledge of the navy and its functions is limited. A fund equivalent to £400,000 has been placed at the disposal of the committee. Part of this sum will be held in reserve to subsidize inventors who are working to improve naval architecture and naval weapons. The movement is obviously receiving official support, for the Navy Department has sent the battleship *Satsuma* from Maidzuru on an "educational" cruise along the coastline fronting the Sea of Japan, and, the papers state, "her chief mission is to diffuse the maritime spirit among the people at the various ports of call." At each port visited the ship is thrown open to the public, and officers specially borne in the vessel deliver lectures at the local schools on Japan's need of sea power.

The first Japanese press comments to hand on the note issued by the foreign office last month (agreeing that "if any situation arises whilst the Anglo-Japanese alliance remains in force in which the procedure prescribed by the terms of the agreement is inconsistent with the procedure prescribed by the Covenant of the League of Nations, then the procedure prescribed by the said covenant shall be adopted and shall prevail over that

prescribed by the agreement") show that in Japan, at any rate, the alliance is already regarded as defunct. The *Mainichi* says it is completely null and void, the *Kokumin* speaks of it as "the ghost alliance," and the *Yorodzu* writes: "From to-morrow the Anglo-Japanese treaty of alliance will practically be a dead letter. In fact, the alliance came to an end with the assistance given by Japan to Britain during the Great War. Though it may formally continue in force for a maximum period of one year, unless it be renewed in the interim, it will be of no effect whatever. Even if it be renewed in future it will be only in such a form as may accrue solely to the benefit of the Anglo-Saxon race. In any case, the whole world is falling under the sway of that race." Language of greater warmth than this is used by other journals, whose indignation at the supposed annulment of the alliance is strangely in contrast to the views they expressed at the height of the war, when they spoke of it as obsolete, and even recommended its substitution by a German-Japanese compact.—*Naval and Military Record*, 7 September, 1921.

JAPAN'S ATTITUDE.—Having notified her willingness to take part in the Washington Conference on the limitation of international armaments, Japan is now reviewing her naval position and naval needs. She is measuring her strength against the United States and Great Britain with perfect frankness and impartiality, obviously for the reason that these are the only two sea powers to be reckoned with in the Pacific. And the conclusion to which the Japanese Admiralty are reported to have come is that a proportion of two ships to the American three and the British four would be a perfectly adequate provision. These calculations are arrived at on the basis of distances. The United States seaboard is some 5000 miles away from Japan, and hostile operations by the United States would necessitate the employment of at least this ratio of superior numbers to stand any chance of success.

The one qualifying possibility in this computation which is very much exercising the minds of Japanese naval administrators is the development of Guam and Manila into first-class naval bases. Such a step would obviously profoundly affect the strategic situation, and Japan makes no secret of the fact that the question will have to be satisfactorily resolved at the Washington Conference. We cannot find anything unreasonable in this view, for the fortifying of these two geographically important spots could only have reference to Japan as an objective. Flanking the great eastern highway as they do, the matter is likewise not one of indifference to this country. The practical response to such a policy would be the corresponding development of Singapore, and it is because Japan clearly realizes this that she takes British naval potentialities into her calculations.

Presuming that the United States were to persist in the expansion of Guam and Manila into great naval bases, Japan declares that her security would demand a fleet at least as large as that of America. But, having laid down this proposition, she candidly admits that it would involve an intolerable financial commitment. A capital ship of the latest type cannot be built in a Japanese yard for less than £8,000,000.

A program of competition with the United States Navy would therefore be ruinous, for we may certainly assume that America would promptly take up such a challenge and increase her shipbuilding accordingly. In both countries the position is clearly realized, and the burthen of obligations will undoubtedly form the great determining influence at the Washington Conference. The real negotiators, indeed, are America and Japan. If they can agree it will be a comparatively simple matter for us to harmonize our own policy with their decision. And we believe that they will agree, if for no more lofty reason than that neither can afford the colossal expenditure which would be imposed by the alternative.—*Naval and Military Record*, 14 September, 1921.

RAZING OF FORTS TALKED OF.—Japan will consult with other members of the League of Nations relative to the desire of the United States to receive equal treatment in mandate islands of the Pacific as a feature of the settlement of the Yap question, it is said by newspapers here. Japan will also study the American claim to land ownership in Yap, as foreigners do not have the right to land ownership in Japanese territory.

It is estimated that this country's expenses at the Washington Conference on limitation of armaments and Far Eastern questions will be about $2,000,000. Government leaders believe the conference will be in session for two months.

It has been decided that the chief of the Japanese delegation shall sail for the United States on board the steamer *Kashima Maru* on October 15. This steamer will take to America a number of Japanese business men, who will proceed to England after visiting the United States for two months.

It is believed that Japan is awaiting information regarding the character of the British and French delegations before finally deciding on the man who will act as chief at the Washington Conference. H. Ijuin, former Ambassador to Italy, has been suggested as one of the men who might be chosen chief, while there are reports that Premier Hara is attempting to induce Viscount Chinda, former Ambassador to the United States and to England, to accept the post.

Another meeting of Japanese field marshals and the Supreme War Councillors has been held, and the Yomiuri Shimbun says that the army's attitude on the limitation of armaments is as follows:

"Japan will maintain her already settled principle of national defense, and no change or alteration will be made until the time arrives when international disputes and trouble can be settled without relying upon, or resorting to, armed force. This is because of Japan's particular national status, and the situation which exists in surrounding the states."

This would indicate a change from the previously announced decision of Japan, which supported, in principle, the maintenance of 21 army divisions. It would seem she would be disposed to follow other nations in actual reductions.

Leading newspapers declare that it is the intention of army and navy authorities to propose definitely the reduction or abolition of fortifications in the Hawaiian Islands, the Philippines and Guam in exchange for the dismantling of Japanese fortifications on Formosa and the Pescadores Islands, and at Port Arthur and Bonin. Confirmation of this report, however, cannot be secured, but the opinion is general that this proposal may prove one of the principal points of the Japanese proposals.

"Perhaps the idea of dismantling fortifications in the Pacific," said an authority yesterday, "is a hope rather than an expectation. Certainly the making of a fortress out of Guam, which is near Japan, might be considered a theoretical menace in the same sense that America would look upon a British fortress in Jamaica in the same light."—*New York Times*, 25 September, 1921.

JAPANESE SHIPYARDS INACTIVE.—Indicative of the continued depression in the shipbuilding industry of Japan, Trade Commissioner H. A. Butts states that during the month of June only two ships were launched in the Osaka district, one of 2600 tons and one of 114 tons. Three vessels were completed one of 2560 tons, one of 969, and one of 99 tons. Out of 45 shipyards, 28 have gone out of business, the remaining 17 maintaining operations with difficulty.—*Nautical Gazette.*

UNITED STATES

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED SEPTEMBER 30, 1921

Type, number and name	Contractor	Per cent of completion			
		Oct. 1, 1921		Sept. 1, 1921	
		Total	On ship	Total	On ship
Battleships (BB)					
45 Colorado	New York S. B. Cpn.	80.7	79.2	78.4	76.8
*47 Washington	New York S. B. Cpn.	69.7	63.5	69.3	63.
48 West Virginia	Newport News S. B. & D. D. Co.	62.5	55.5	61.	53.4
49 South Dakota	New York Navy Yard	34.6	27.	34.1	26.5
50 Indiana	New York Navy Yard	32.5	24.3	†31.2	24.
51 Montana	Mare Island Navy Yard	27.6	19.	27.3	19.
52 North Carolina	Norfolk Navy Yard	36.6	27.1	36.5	27.1
53 Iowa	Newport News S. B. & D. D. Co.	29 5	25.	29.	24.8
54 Massachusetts	Beth. S. B. Cpn. (Fore River)	10.4	3.9	10.4	3.9
Battle Cruisers (CC)					
1 Lexington	Beth. S. B. Cpn. (Fore River)	25.5	16.5	24.2	15.
2 Constellation	Newport News S. B. & D. D. Co.	14.5	12.6	13.3	11.1
3 Saratoga	New York S. B. Cpn.	28.4	20.	27.4	18.7
4 Ranger	Newport News S. B. & D. D. Co.	2.7	1.1	2.5	1.
5 Constitution	Philadelphia Navy Yard	11.1	6.3	10.7	6.
6 United States	Philadelphia Navy Yard	10.7	5.9	10.4	5.7
Scout Cruisers (Light Cruisers CL)					
4 Omaha	Todd D. D. & Const. Cpn.	94.7	87.9	94.6	87.2
5 Milwaukee	Todd D. D. & Const. Cpn.	92.5	84.6	92.4	84.
6 Cincinnati	Todd D. D. & Const. Cpn.	87.4	80.8	87.1	79.5
7 Raleigh	Beth. S. B. Cpn. (Fore River)	63.7	45.6	63.7	45.6
8 Detroit	Beth. S. B. Cpn. (Fore River)	68.5	50.6	66.3	48.2
‡9 Richmond	Wm. Cramp & Sons Co.	74.	64.	70.	59.
10 Concord	Wm. Cramp & Sons Co.	68.	53.	66.	49.
11 Trenton	Wm. Cramp & Sons Co.	51.	35.	50.	34.
12 Marblehead	Wm. Cramp & Sons Co.	46.	30.	46.	30.
13 Memphis	Wm. Cramp & Sons Co.	40.	25.	40.	25.
Auxiliaries					
Repair Ship No. 1, Medusa (AR 1)	Puget Sound Navy Yard	69.3	53.9	68.	51.2
Dest. Tender No. 3, Dobbin (AD 3)	Philadelphia Navy Yard	56.3	66.	66.3	66.
Dest. Tender No. 4, Whitney (AD 4)	Boston Navy Yard	34.9	31.1	32.8	28.1
Sub. Tender No. 3, Holland (AS 3)	Puget Sound Navy Yard	21.5	5.5	21.6	5.5
Aircraft Tender, Wright (AZ 1)	Tietjen & Lang	92.	.....	90.	....
Patrol Vessels					
Gunboat No. 22, Tulsa (PG 22)	Charleston Navy Yard	70.8	54.5	70.6	53.4
Destroyers					
338 Wasmuth	Mare Island Navy Yard	99.5	99.5	99.2	99.2
339 Trever	Mare Island Navy Yard	97.5	97.5	97.3	97.3
340 Perry	Mare Island Navy Yard	76.3	74.5	71.6	70.7
341 Decatur	Mare Island Navy Yard	75.2	69.4	65.4	64.5

* Battleship No. 47, Washington, launched Sept. 1, 1921.
† Previously reported 31.2.
‡ Scout (Light) Cruiser No. 9, Richmond, launched Sept. 29, 1921.

Authorized but not under construction or contract: (1) Transport No. 2.

Destroyers authorized but not under construction or contract: (12) Nos. 348 to 359 inclusive.

OUR DEPLORABLE POSITION IN THE WESTERN PACIFIC.—Maritime nations have always been rivals for sea trade, just as the merchants in any town are rivals for the trade of that town. In every town there are laws which govern precisely the relations between the merchants, there are courts to which merchants may appeal in case of bad treatment by other merchants, and there is a police force to compel obedience to the decision of the courts; but on the sea there are no laws, no courts and no police force to insure fair dealing among nations. For this reason each nation has to maintain its own armed force to guard its rights.

This does not mean that all nations are enemies of each other any more than it means that all merchants are enemies of each other. The rivalries of nations and of merchants are usually of a friendly character; for in both international relations and mercantile relations it is realized that war and strife are losing procedures in the main. For this reason many measures are taken to foresee and control the causes of war and strife.

One of the measures taken is to remove temptation to robbery and theft, by guarding possessions: *for an unguarded possession presents a distinct temptation to a rival.* Therefore, no nation regards the arming of a colonial possession as an evidence of unfriendliness or distrust, any more than a merchant regards an insistence on suitable guarantees as an evidence of unfriendliness or distrust. The closest friends and even relatives observe business methods in their business dealings with each other; rightfully regarding such observance as a necessary precaution against possible misunderstandings, and therefore as an insurance against a possible rupture of friendliness. Any man who would disregard such precautions would put himself in the power of other men and be regarded as a fool.

Yet this is exactly what the United States has done in the West Pacific by failing to defend the Philippine Islands. By so failing, we have put ourselves in the power of our good friend, Japan, by making it possible for her to capture them with very little effort and to prevent our recapturing them, except at the cost of an effort that we may not be strong enough to make.

It has been said that Japan does not want the Philippine Islands: that she prefers to expand on the mainland of Asia. This may be true; but it may be pointed out that the Philippine Islands cover more than two-thirds as much area of land as Japan does; that they cover more than twice as much area as the state of New York; that they are vastly richer in natural resources than either Japan or New York; that they lie as conveniently near to China as Japan does; that their harbors are fully as good as those of Japan; and that, if properly defended and developed, they will form a better commercial base than Japan itself for prosecuting trade with China, and for building the railroads and doing the other kinds of public work that have already been begun.

Furthermore, even if Japan should not want the islands for herself, it is inconceivable that she likes to see us there, because the Philippines flank Japan's lines of communication not only to Guam, but to Yap and her other newly acquired Pacific islands, and even to the Mediterranean. Japanese steamers stop at Philippine ports while going to and from the Mediterranean.

Since it has always been the custom for great nations to defend their insular possessions, and since it seems distinctly advisable for us to defend the Philippines, it may be asked why we have not defended them. There are two reasons:

1. The American people have never realized the practical value, both commercially and strategically, of the Philippines, and have been misled by the phrase "give the Filipinos their independence." The word "independence" has an effect on an American that is amazingly appealing; he will instinctively agree to almost any proposition granting "independence" to almost anybody. For this reason the American people were slow in deciding to retain the islands after Dewey captured them, and Congress

adopted a resolution virtually declaring the intention of the United States to give the Filipinos their "independence."

Now this looks superficially like a fairly good reason for not defending the islands. In fact, it seems to be regarded by some people as virtually obliging the United States to present the islands to the Filipinos, and to constitute an actual bargain with them. But really it does neither; for the reason that it was a mere statement of an intention held long ago, at a time when the importance of the Philippines was not understood, and when it was not realized that to hold the Philippines undefended made them actual hostages in the hands of Japan and put us in her power. Such, however, seems to be the fact, because both nations know that the ability of Japan to capture the islands enables her to hold a constant threat over our head; both nations realizing that, if the Japanese should capture them, public opinion would force us to try to recapture them, that the cost of the attempt would be prodigious, and that the attempt might not be successful. Remember that we have no base except in the islands, that the Japanese might adopt Fabian tactics, and remember also the fate of Hannibal in Italy after Fabius refused to fight.

2. The other reason for not defending the Philippines is that it has been deemed impossible to defend them, except at a cost in money wholly prohibitory. But, as I pointed out to the General Board of the Navy in the winter of 1910-1911, and have continually reiterated since, it is perfectly possible to defend them at small cost if we will only take advantage of the power that the airplane put into our hands several years ago. The airplane gave us the power to prevent troops from actually invading the islands, by dropping bombs on them before they could reach the shore.

Remember that any transports carrying troops destined to invade the Philippines would have to anchor at some distance from the beach selected as a landing place. Remember that the boats would then have to be gotten out and lowered into the water and placed alongside the transports at designated spots; that then all the men, ammunition, supplies, equipments and artillery would have to be placed carefully in the boats; and that then those boats (small, open boats) would have to be towed to the shore, crammed full of their living and unliving freight. Remember, too, that during every instant of the procedure thus briefly sketched, the transports, boats and men would be helpless against bombing airplanes, and that those planes could drop so many bombs on the boats that it would seem no boat could escape being hit; for the bombs need not be more than a pound in weight, and *each plane could carry hundreds of bombs.* The escorting ships could not even fire at the airplanes, because they would be more apt to hit their own boats than to hit the airplanes.

But even granting that the boats could reach the beach (it seems more than doubtful that even one boat could do so), how could the troops possibly land on the beach, get out from the boats all of their supplies, equipments, munitions and artillery, and then form and march over the long rough road to Manila if attacked persistently with bombing airplanes?

It may be objected that the enemy might bring airplanes and use them against the bombing airplanes. True, but airplanes operated from the stable and commodious conditions of the land and of the quiet little bays abounding in the Philippines could be launched in much greater numbers and much more quickly than from the crowded and unstable conditions of shipboard.

It may also be objected that pursuit planes could be sent from Formosa. True, but the southernmost tip of Formosa is two hundred miles from the northernmost tip of Luzon, and three hundred miles from any good landing beach. Now, three hundred miles is a great handicap to pursuit planes.

It may also be objected that no planes might be in readiness to bomb the would-be invaders when they arrived. This is possible, of course, on the general theory that almost anything is possible. But the great speed

of airplanes, combined with the facilities given by the radio telegraph, endows airplanes engaged against relatively slowly moving bodies, such as ships and soldiers, with a degree of *concentratability* hitherto unknown. By means of this concentratability and the help of scouting airplanes the probability seems to be almost one hundred per cent that no transports could land troops in Luzon before airplanes could reach the landing beach.

It may also be objected that Japan might use bombing airplanes instead of troops, or in co-operation with troops, to bomb out the present defenses of the Philippines, and then to bomb Manila itself, and thus force it to surrender. This is true, but it is respectfully suggested that this fact, instead of constituting an argument against defending the Philippines with airplanes. constitutes an unanswerable argument in favor of it. because the best defense against airplanes is airplanes.

It is a matter of frequent remark that the three countries most deeply interested in the coming Conference are the United States, Great Britain and Japan. Now these countries are great friends, and in some ways their interests are identical and a continuance of friendly relations a great desirability. Yet the fact stares us in the face that *the most fortunate thing commercially for any one of those countries would be that the other two should go to war against each other,* because such a war would make her the mistress of the commerce of the world. If we and Japan. for instance, should go to war, and Japan should take the Philippines, our national resources would be strained so much and for so long a time that it seems probable that Great Britain would soon resume her place as mistress of the sea. What would happen to the United States cannot clearly be foreseen.

Doubtless "everything will come out all right," but one may feel justified, nevertheless, in regretting that our weakness in the Philippines should have been permitted to exist for so many years, and to continue to the present crisis. No harm is done by alluding to it publicly, because *it is perfectly understood by foreign nations;* in fact, Mr. Bywater devotes many pages to making it clear in his recent book, "Sea Power in the Pacific," and expresses surprise that America does not seem to realize it.—*Army and Navy Journal,* 21 September, 1921.

AIR CRAFT VS. SURFACE VESSELS AND SUBMARINES.—The bombing by the army and navy aviation services of the enemy and obsolete surface and submarine vessels really proved only what was already known; that is, that what man has made he can unmake. As practice such tests are useful; as demonstrations of what will happen in war all firing at targets—of course the tests were nothing more—are unreliable, because the retaliation, and what is just as important, the fear of retaliation, cannot be simulated.

Before the tests anybody could be sure that if the airships kept on dropping more and more high explosives on the vessels, the vessels would ultimately be sunk. Everybody who had read and thought about the matter knew that aircraft nowadays is an essential weapon of offense and defense in naval warfare, but nothing in the bombing tests has proved that any class of surface or submarine vessels is obsolete because of the dangers from attack by aircraft. The tests did illustrate, of course, that if large quantities of high explosives are likely to be dropped on the decks of vessels or in the water near them, it is desirable that the vessels be constructed with reference to giving as much protection as possible against such attack.

Everybody knows that no protection is absolute and that there is no more reason to suppose that absolute protection can be given against aircraft attack any more than it can be given against gunfire from surface vessels. In war people are likely to get hurt and we must not discuss war from the point of view of the German-American citizen who sat on a coroner's inquest listening very intently to the evidence, the corpse lying before them under a sheet. Finally, in a pause in the proceedings he arose, lifted a corner

of the sheet and glancing at the dead face turned and said in a tone of horror to the coroner and his fellow jurymen, "My God, gentlemens, dis man vas dead."

In future wars vessels will be destroyed and the crews killed just as they have been for some thousands of years in past wars. Machine guns will kill infantrymen—millions were so killed in this way during the World War, but nevertheless infantry is not obsolete. The infantry minimizes its casualties by lying down, crawling around or attacking the machine guns with mortars and artillery. What is true of men is true of the matériel, both on land and sea. The fact that in a naval battle many ships are destroyed, does not mean that it is useless to build ships. The victor may lose most of the ships but if the vanquished has lost all of his the fruits of victory are adequate to the losses.

Let us not be carried away or become hysterical and go to one extreme or the other. During the war there was a constant cry that the old methods were obsolete and the training must be wholly for trench warfare. General Pershing was not carried away, but insisted on our troops being trained for open warfare, and it turned out to be one of the wisest decisions that was made in our behalf during the war. The truth is that no class of surface and submarine vessels is obsolete and that in any future wars the auxiliaries, that is the submarine and the lighter vessels of the enemy will have to be neutralized by our auxiliaries and the heavy fighting done by the line battleships—the infantry of the sea—as it always has been. What is and always has been obsolete is an unbalanced fleet. We have never had a balanced fleet and the sooner we recognize this fact the better. If we are willing to trust to agreements and the gentleness of human nature, then we do not want a fleet. But if we are not, and we think that war is a possibility, then it is the height of folly not to have a *balanced* fleet that is adequate to conquer any enemy we may have to fight.

Heavily taxing the people to build and maintain an unprepared or unbalanced fleet is a useless extravagance.—*National Service*, October, 1921.

AMERICAN NAVAL PROGRESS.—The launch of the battleship *Washington* at Camden, N. J., on September 1, means that three of the ten 16-in. battleships authorized under the building program of 1916 are now in the water. The others are the *Maryland*, launched on March 20, 1920, and the *Colorado*, launched at Camden on March 22, 1921. These ships are all to carry eight 16-in. guns in their main armament, and so will the *West Virginia*, which is rather behind them in point of progress, having only been laid down in April of last year. The other six battleships, however, of the *South Dakota* type, are larger and more powerful, with a main armament of twelve 16-in. guns. No date has yet been mentioned for their being put afloat, but it was stated by Mr. Amery in his speech on the shipbuilding vote in the House of Commons on August 3 that they would be completed by the end of 1924 or the beginning of 1925. In other words, they will be ready no sooner than the four British capital ships which are about to be ordered to replace some of those scrapped since the armistice. These new British ships are expected to occupy three years in construction from the date of the signing of the contract. It cannot be assumed, of course, that there is any sort of competition between the two countries in this respect. If there was, it would be necessary for us to be laying down something like sixteen big ships this year instead of four, since we have only the *Hood* as a post-Jutland ship to put against those laid down by America since 1917, and even the *Hood* has only 15-in. guns. However, there will be much mutual interest displayed in both countries in each other's designs. One thing which the progress of the new American ships does emphasize is the expansion of the resources for the construction of war vessels and the manufacture of naval war material in the United States.

It is understood that there is a minimum of fifteen slips capable of taking the largest ship yet contemplated. Now that our own public yards have unfortunately been left behind owing to the events of the war, so that none of them possess a slip capable of taking such a ship as the *Hood*, it would be interesting to know exactly how the private yards stand in this respect. We should rather doubt whether they have as many as fifteen slips; on the other hand, the official period of three years from the contract date shows that it is anticipated that they will be capable of more rapid consruction than has hitherto been achieved with the new American ships.—*Army and Navy Gazette*, 17 September, 1921.

SINKING OF "U. S. S. R-6."— The U. S. submarine *R-6*, in command of Lieut. I. R. Chambers, U. S. N., sank at 9.15 p. m., September 26, while alongside the U. S. S. *Camden*, her tender, in San Pedro Harbor, Calif. The following men are reported drowned: Frank Amzi Spalsbury, electrician, 2d class; next of kin, mother, Mrs. Bessie A. Spalsbury, Box 123 Powers Lake, N .D.. John Edward Dresfein, seaman, 2d class; next of kin, sister, Mrs. Minnie Strait, Moline, Ill.

The accident, according to official dispatches received at the Navy Department from Vice Admiral W. R. Shoemaker, U. S. N., commanding the battleship force of the U. S. S. Pacific fleet, was caused by an outboard shutter of a torpedo tube being left open. This caused the opening of the inner tube door, as the interlocking device failed to work. Besides Lieutenant Chambers, the ship's company consisted of Lieuts. S. D. Jupp and J. M. Steele, and twenty-seven enlisted men. Operations to raise the submarine were at once ordered, and as her conning tower was reported to be only six feet under water, it is expected that she can be easily raised. The *R-6* is a first line submarine, launched March 1, 1919, and she was commissioned May 1, 1919.—*Army and Navy Journal*, 1 October, 1921.

BARS USE OF SAILORS AS "STOOL PIGEONS."—Secretary of the Navy Denby does not purpose to permit the use of sailors as police "stool pigeons" or the use of the navy uniform in fighting vice in coast cities. He made this plain by denouncing the alleged employment of sailors as "stool pigeons" by the San Diego (Cal.) police.

His denunciation echoes the sensational disclosures of the alleged use of enlisted men of the navy as "stool pigeons" to stamp out vice at Newport, R. I. A formal statement said, in part:

"Attention of the Navy Department has been directed to evidence given in a trial at San Diego, Cal., in which it was stated that sailors of the navy had been used as 'stool pigeons' by the police. Secretary Denby, on reviewing the published reports of such action, sent a dispatch to the commander-in-chief of the Pacific fleet, Admiral Eberle, expressing the department's determined stand against the use of enlisted men for this purpose and calling attention to the navy's written instructions regarding the extent of co-operation with the civil authorities and directing the commander-in-chief to make a personal and thorough investigation of the matter.

"The statement, as reported, was made at San Diego, at the hearing of Police Judge Ed. L. Davis, under grand jury indictment for misconduct in office. In his defense Judge Davis, in referring to a case where a woman charged with having agreed to relations with two sailors who, it is claimed, were used as 'stool pigeons,' is quoted as saying.

"'I was told that the sailors had been given marked money to give to the woman, and that policemen broke into the room at a prearranged time. It struck me as horrible that boys away from home in training for citizenship, both morally and physically, should be hired for such despicable work. I considered it the duty of the court to discourage such practice and that is why I dismissed the case.'

"In regard to vice conditions in San Pedro, the Secretary on June 9 sent the following letter to the commandant of the eleventh naval district:

"'The department does not desire that the commandant handle the vice conditions that may exist in the eleventh naval district in the manner described in his letter, and accordingly directs that F. W. Becker, enrolled as a lieutenant, United States Naval Reserve Force, be not employed as recommended.'

"'The department desires that the commandant co-operate with the civil authorities for the suppression of vice, as it affects the naval personnel. The primary responsibility for social conditions within any community rests on the civil government, and the department does not desire that the personnel of the naval service, the uniform of the naval service or persons employed by the navy be utilized for services that properly belong to the civil police.'

"At the same time Secretary Denby wrote to Meredith P. Snyder, Mayor of Los Angeles, disapproving recommendations made by the Los Angeles Chief of Police that members of the police force of that city be permitted to wear the uniform of the navy or the marine corps in the discharge of their duty."—*Baltimore Evening Sun*, 23 September, 1921.

HARDING APPROVES NAVY YARD ECONOMY.—President Harding will not intervene in behalf of the 50,000 civilian employes of navy yards whose wages recently have been reduced by the Navy Wage Board. The judgment of the board and Secretary Denby, it was learned authoritatively to-day, will be final, and the wage cuts are in line with the administration's policy of getting back to normal.

Numerous protests of the reductions, which became effective September 16 in all the navy yards of the country, have been presented to the President by representatives of the men and union leaders in an effort to force a reopening of the award. Although the President has made no formal review of the findings, he is understood to approve generally. Secretary Denby was positive to-day in his assertion that the award will not be reviewed.

"The matter is a closed incident," said Secretary Denby. "The cut is made already, is in effect and is going to continue."

The administration has little patience with the criticism of the governmental policy which does not keep all the navy shops and plants in full operation at the present time. The President and his advisers regard as absurd the view that wartime activity should be maintained in navy yards, even if present appropriations would permit of such a course. Curtailment both in the activities of the navy yard plants and in the payrolls, is the definite program to be followed to eliminate the abnormal conditions which grew up during the war.—*Philadelphia Public Ledger*, 23 September, 1921.

SHIPPING BOARD IS RAPIDLY WHIPPING BAREBOAT CHARTER PLAN INTO SHAPE.—The bareboat-charter plan for the disposition of the Government fleet is now rapidly taking form under the three operating vice-presidents, and will be put into effect with a modified allocation system. The main points of the changes in policy which the Board will adopt have now become public. Under this scheme the government vessels will be continued in operation until fundamental conditions in shipping have been reversed and the vessels can be sold.

While the final form of the charter party has not yet been drafted, indications during the week are that this will contain the following provisions:

1. The Shipping Board will bear the expense of hull and machinery insurance.
2. The charterer will pay voyage repairs.
3. The Shipping Board will pay for repairs made necessary by latent defects in construction.
4. The charterer will assume the cost of protective and indemnity insurance.

5. The charter rate per deadweight ton will probably not be more than fifty cents per month, and will vary according to the conditions on separate routes.

Several vessels have already been chartered by the Board on substantially these terms, and while officials deny that the plan is in final shape there is good reason to believe that the public announcement in the near future will show these cardinal features of the charter party. The Board is now getting the views of steamship owners and operators on the proposition and will consider their opinions in drafting the plan. The original purpose of Chairman Lasker to make the bareboat charter system operative at once, with full abandonment of the allocation policy, has been modified considerably within the last few weeks. It is evident at present that this will be only one feature of a more comprehensive policy which will also include a certain amount of support for the steamship operators.

A study of the Merchant Marine Act has convinced the commissioners that the Board must continue certain strategic services regardless of the expense. Chairman Lasker has stated definitely that the law will be observed. This means that on trade routes which hold out immediate prospects for profitable operation, the Board will charter vessels under the new plan. But on the other services where traffic is poor and a constant loss is shown, the Board will continue temporarily to operate a minimum number of vessels on the existing commission basis. According to the intentions of the Board at present indicated, the bareboat charter system will be in force from certain ports from certain routes, while on others the allocation plan will be undisturbed.

In making the decision not to eliminate the allocation of ships entirely, the Board has taken drastic measures to cut the losses of operation to a minimum and to avoid competition between government vessels. Where two or three steamship lines are running on the same berth, with insufficient traffic and constant loss, the Board will concentrate the ships in the hands of one or two companies, and will continue in service only enough tonnage to care for the trade on a regular sailing schedule. In carrying out this plan Chairman Lasker expects by the middle of October to have not more than 350 ships in operation, or approximately one-fourth of the government fleet. These will be the best constructed and most efficient of the war-time fleet and will be retained by the Board as the foundation upon which to build up an American merchant marine. It is the belief of the chairman that the operating losses by this means can be kept down to $5,000,000 a month, or eliminated entirely if trade conditions improve or the Jones Law is made fully effective.

The Board has already begun to put its new policy into effect. Within the last week announcement has been made that the Pacific Steamship Co. has chartered two ships for the movement of grain in bulk from the Pacific Coast to Europe. The action of the Admiral Line in chartering these vessels has discounted the arguments presented to the Shipping Board that it would be almost impossible just now to place ships on the charter basis.

In fixing the charter hire, which in the case of the Admiral Line was 50 cents per deadweight ton per month, the Board will consider the condition of trade, the amount of competition and the financial ability of the companies. It is expected that in some instances the rate will be nominal, only one or two cents a ton, while in others the Board may actually offer to pay the protective and indemnity insurance or voyage repairs to compensate certain companies for the charter hire. The Board will make the most favorable terms possible to get its ships under charter and to avoid the continuance of the allocation plan.

The Shipping Board Claims Commission is now actively at work, and within the last week has disposed of eight cases in which the attorneys for the Board and the claimants reached an undisputed agreement. All of these were for amounts less than $2000 each. As a general policy, the Commission has announced that it will have its own examiners investigate

each of these negotiated settlements, partly as a precaution and also as a protection to the attorneys for the Board, whose firms in many instances are representing claimants.

As fast as the Board notifies the Commission that it is ready to proceed with certain cases the latter will schedule a hearing. The claim of the Downey Shipbuilding Corporation, involving $4,000,000, will come up shortly.—*Nautical Gazette*, 1 October, 1921.

AERONAUTICS

WHAT THE VIRGINIA CAPES AIRCRAFT BOMBING TESTS SHOW.—The conflict between the air bombing squadron and the ex-German battleship *Ostfriesland* off the Virginia Capes was an epoch-making incident in the ever-present conflict between the old and well-established and the new and untried. The new device proved successful and indicated a future.

When the United States entered the world war in 1917 it did not possess a single military flying machine, and of the two score training planes then owned by the army and navy there were barely a baker's dozen capable of an hour's flight. Not quite four years have elapsed between the foundation of American military aeronautics and the sending out of the unprotected David of the air with a few bombs to do battle with the Goliath of the sea protected with armament representing forty years of sustained development costing billions of dollars. The battleship went to the bottom of the ocean in less than twenty-five minutes. Still the aircraft engineers responsible for this remarkable performance thoroughly realize the crudeness of the airplane, especially as regards the sighting, aiming and bomb-dropping devices.

The battleship can be made larger and faster, but this will not make it less vulnerable to aerial attack. The airplane, however, is only at the threshold of its development. The question seems to be one of time when the battleship will be driven from the sea.

American engineers have particular reasons to glory in the success of our flyers. The planes used were chiefly of American design, driven by a typical American motor. The bold conception of the test was on a par with the big things done every day by our engineers, and the daring of the men who flew for over a hundred miles out to sea in planes which had no facilities for landing on the water is something of which the nation may well feel proud.

Great honor must be given to the persistent and marvelous organization of the Air Service, which carried this difficult task to such successful completion. This is due in large measure to the enthusiasm and leadership of General Mitchell and his extremely able corps of assistants. Colonel Bane, chief of the Engineering Division of the Air Service, is another who should receive no small amount of praise and congratulations.

From my experience in connection with the production of the first depth bomb for the navy, I am convinced that it is the only device capable of reaching the vulnerable parts of a battleship. The enormous sledge-hammer blow that is delivered to the ship's structure by a depth bomb at a distance is something prodigious. The compressibility of water being only 1/150 at the pressure of one ton per square inch, it acts to all intents and purposes as a perfect solid in transmitting the enormous concussion. Mass action is the secret of the success of the depth bomb, as is shown in the following formula:

$$P = \frac{0.68\,WK}{D^{1.85}}$$

where P is the effective pressure in tons per square inch against the target from the depth bomb; D the distance from the center of the charge to the face of the target, in feet; K the coefficient, which for the TNT equals 3.17; and W the weight of the charge in pounds.

In early bombing days, from the heights to which anti-aircraft guns drove the aircraft it was lucky if the bomb was able to hit the township containing the target. The precision obtained since that time in the various elements of the bombing equipment is due in no small measure to the astute, practical mathematician, the man who is 100 per cent mathematician and also 100 per cent engineer, in being able to point out a practical and physical, as well as simple, solution of otherwise very perplexing and abstruse formulas. This, together with the new method of stabilizing, finding and being able to hold the exact vertical reference line, and precision flight due to great care on the part of the pilot, are all important elements, but in the last analysis the level head and horse sense of the "man behind the gun" constitute no small part of the answer.

So aircraft, which is the natural American heritage, is coming not only into its own, but assuming nothing short of sovereign leadership in direct offensive action, and it has remained for America again to lead the way.

There are many defensive actions in which aeronautics will from now on take prominent leadership, and all are based on the most highly organized engineering analysis and skill. I, therefore, recommend that our Aeronautic Division make a close study of these intensely interesting activities so as to be in readiness to extend first aid in this all-important development.—*Mechanical Engineering*, September, 1921.

BENDING STRENGTH OF "ZR-2."—If *ZR-2* buckled while she was making a sharp turn at high speed—and more than one witness has testified that she did—she was the victim of a lack of girder strength which is inherent in all airships of the rigid type. By this we do not mean to say that all dirigibles are weak to the point of danger, but we do wish to emphasize the fact that the frame of a dirigible is so constructed that it cannot be considered as a trussed beam, and therefore its great diameter or depth cannot, as in the case of a bridge truss, be taken as a measure of its bending strength.

This inherent weakness is due to the fact that the presence of the huge gas bags prevents the introduction of any longitudinal, diagonal ties across each section or panel. To use these it would be necessary to provide gas-tight tubes passing diagonally through the gas bags—an obviously impossible construction. An attempt is made to provide longitudinal strength by bracing and tying together the longitudinal girders and the exterior polygonial frames, so as to secure something of the stiffness of the shell of a tube; but the whole construction, to the eye of an engineer, looks extremely frail when it is applied, as in this case, to a structure that is eighty-five feet in diameter and some 700 feet in length.

There is, of course, an interior truss running along the bottom of the framework—a triangular truss of great strength and stiffness—but it is shallow as compared with the vast skeleton frame along the bottom of which it lies. When the heavy cross-bending strain, induced by setting the rudders hard over when the ship was running at high speed developed, stresses of compression and tension were set up in the frame of the ship, which the relatively small triangular truss below could not do very much to relieve.

In making the above suggestion we do not wish to throw any doubt upon the practicability of lighter-than-air navigation. Faults either of design, material, or handling existed in the ill-fated *ZR-2;* but this does not prove that dirigibles of the great size of this one cannot be built of sufficient strength to stand any of the reasonable mischances of the air. Now that the wreck is being salvaged and the log of the commander of the ship has been recovered, we shall probably learn in due course just where the break occurred and why. Every new art has its failures and alas, its disasters accompanied by large loss of life; but the art goes forward. We are among those who believe that the day may come when gas bags can be eliminated and the whole body of the ship sheathed with some light

alloy so that it can serve as the container. The all-metal dirigible, for reasons of strength and safety, is as desirable as the all-metal airplane.—*Scientific American*, 10 September, 1921.

THE AMERICAN AIR TESTS.—The American naval authorities have no use for theatrical secrecy, and they pride themselves, with reason, on laying all their cards on the table. When, for instance, any particularly interesting experiment is to be carried out, such as the bombardment of an old battleship by gunfire or air bombs, they always invite newspaper men to attend, and even provide special facilities for the "chiels" who are "takin' notes." They adopted this method on the occasion of the recent bombing practice against ex-German warships, with the result that very complete accounts of the event have been published for all the world to read. In our view this policy of frankness is infinitely to be preferred, from every point of view, to one of secrecy and mystification, and we venture to congratulate the American naval chiefs on having adopted it—not merely in this particular respects, but equally in regard to their naval programs and new construction and we wish that other Admiralties would follow their example. As the initiated know, there are very few naval "secrets" that are really secret, yet in certain countries the public is still bluffed into believing that an elaborate display of mystery is essential to the national safety. This, however, is a digression, our purpose being to emphasize the great importance attaching to the recent bombing tests by the U. S. Army and Navy. It is the first time that experiments of this kind have been carried out on so extensive a scale and in circumstances simulating war conditions, and of the two lessons that have emerged it would be difficult to say which is the more significant. These lessons are, first, that a modern heavily armored capital ship is liable to be destroyed by bombs dropped from aircraft; and, second, that the application of wireless control to practically every type of vessel used in naval warfare is a perfectly feasible proposition. It may be argued that both these results might have been, and were, anticipated, but the fact remains that they have now been conclusively demonstrated, and we have advanced from the uncertain footing of theory to the solid ground of knowledge.

If, on the one hand, the small percentage of hits registered on the moving target ship *Iowa* should serve to check the exuberance of aviation enthusiastics who have been chanting dirges over the *Dreadnought;* on the other, the appalling effect of very heavy bombs on the *Ostfriesland* should give pause to the sceptics who have hitherto denied aircraft any serious rôle in future naval warfare. When we read of two or three 2000-pound bombs being sufficient to disable and sink a battleship that embodied all but the very latest ideas of protection, it is time to ask ourselves whether this new form of attack can be safely ignored. That the conditions under which the *Ostfriesland* was sunk bore little relation to those of war is doubtless true enough, but at least there was as much realism about this experiment as existed when the earliest tests of the torpedo and the submarine were made. There has been up to now a tendency to deny the value of bombing aircraft for naval purposes on two grounds, namely, that they cannot aim straight and that, even when they do hit the target, their bombs cause only superficial damage. The first contention has yet to be disproved, for in the recent experiments only a very small percentage of the bombs appear to have taken effect; but, in view of what happened to the *Ostfriesland*, it is clear that the heaviest bombs now in use are capable of destroying any modern capital ship. If bombs could be dropped from the air with anything like precision, the big ship would indeed be in mortal jeopardy, and it would be criminal extravagance to build any more of the type. But, happily or otherwise, no such degree of precision obtains at present, and for the time being the big ship stands a fair chance of survival against this form of attack, provided she is well enough armed with the anti-aircraft guns to keep the attacking

machines at a height too great for accurate bomb-dropping.—*Naval and Military Record*, 17 August, 1921.

AERIAL PLANES TO BE USED IN "ALABAMA" ATTACK.—New weapons of aerial warfare will be given an initial test when the army air service conducts its next bombing operation—a night attack on the old battleship *Alabama*. The plan is to stage the attack about September 15, probably at the scene of the recent tests upon the former German craft, off the Virginia Capes.

A "light barrage," composed of giant aerial flares, each of more than 200,000 candle-power, will be one feature of the attack. Army engineers have submitted such enthusiastic reports on this weapon that larger flares, estimated to be equal to 1,000,000 candles, have been placed under construction.

Giving a greenish-white light, literally "brighter than day," the flares to be used in the *Alabama* test will illuminate an area of five square miles and, expert flyers say, should enable the aviators to obtain greater accuracy than in the daytime. The flares are attached to a parachute of white silk, which reflects the light downward with sufficient intensity, it is believed, to blind the officers and gunners on the ship under attack, so as to demoralize any plan for defense, while keeping the upper air reaches shrouded in gloom.

Just before the armistice was signed flares of 200,000 candle-power were perfected by the ordnance branch of the Army Air Service. They were equipped with 18-foot parachutes, which kept them aloft while the magnesium burned for a period of from 7 to 11 minutes. No opportunity was afforded for a test against the enemy, however.

Although disappointed that they cannot have the *Alabama* equipped for battle with radio control, as they hoped, the army flyers are exerting every effort to conduct the bombing tests with war conditions as nearly simulated as possible.

It will not be the object of the army pilots to see how quickly they can sink the *Alabama*, but rather to try out special gas and non-extinguishable phosphorous bombs on her, as well as to ascertain the effect of small demolition bombs. Bombs up to 4000 pounds each may be used.

The *Alabama* is at Philadelphia and practically ready for delivery to the air service.—*Aerial Age*, 12 September, 1921.

NAVY BLIMP DESTROYED.—Twenty minutes before she was to have started for the hangar at Lakehurst, N. J., the naval balloon *D-6*, the largest and newest non-rigid dirigible possessed by the navy, burned, with her hangar and three other balloons, at the Rockaway Point Naval Air Station August 31.

No lives were lost, but Machinist's Mate Donald B. MacKay, in the car when the fire started, was severely burned.

The *D-6* was fully inflated and contained about 190 000 cubic feet of hydrogen gas. The other balloons, not inflated, were the kite balloon *A-P* and two small dirigibles, the *C-10* and the *H-1*.

A board of investigation was immediately appointed by Commander F. H. Strong, and after a three-hour conference, in which all members of the crew of the *D-6* were questioned, a report was forwarded to Admiral Moffett, in charge of the Bureau of Naval Aviation in Washington. Commander Strong would not make public the results of the investigation.

It was thought that gasoline fumes from a leaky fuel pipe may have been ignited by a spark from a hammer. A new tank had been installed and mechanics were busy connecting up the feed pipe.

Lieutenant Charles E. Bausch, who was to command the crew of seven men, had just ordered them to get their luggage when he saw flames shooting toward the gas bag. He ordered every man out of the hangar and turned in an alarm which brought all of the 250 men at the station.

The reserve hydrogen tank, containing about 50,000 cubic feet of gas, a steel structure of the cylindrical type, standing 100 feet from the hangar, was used as a vantage point from which the sailors turned streams on the burning hangar and nearby buildings, keeping the sides and top of the tank under two streams of water. Lieutenant Kloor and Commander Strong led the sailors. Their forces were supplemented by fire companies from the Rockaway Park station, and soldiers hurried over from Fort Tilden.

The combined forces kept a water barrage going for more than an hour on all sides of the burning hangar. A stiff breeze was blowing off shore and threatened for a time to carry the fire to the barracks, the Naval Hospital and store houses and across the dry grass to cottages along the shore.

The *D-6* was 200 feet long and 50 feet in diameter fully inflated. She was propelled by two 125-horsepower Union type motors, and could make 55 miles an hour. She had a lifting power of about 10 tons. The *D-6* carried 200 gallons of gasoline and had a cruising radius of 1000 miles. She was assembled at the Rockaway Point Station under the direction of Lieutenant Bausch.

The gondola and engines were built at the League Island Navy Yard in Philadelphia and the balloon was made at the navy balloon plant in Akron, Ohio. The *D-6* was equipped with the limousine type of gondola, completely enclosed, which made it possible, the authorities believe, for the men in the hangar to escape before the balloon ignited. The trip to Lakehurst would have been her maiden voyage, although she had been taken for several short test spins over Jamaica Bay and Coney Island.

The Navy Department has under way plans for several other ships of the *D-6 type.—Aerial Age*, 12 September, 1921.

GENERAL MITCHELL ATTACKS BOMB TEST FINDINGS.—A chapter has been added to the "aircraft *versus* capital ships" discussion that has caused so much comment in Washington this year.

This new development comes from a report made by Brig. Gen. William Mitchell, Assistant Chief of Air Service, on the bombing tests held two months ago off the Virginia Capes. The report was submitted to Maj. Gen. Charles T. Menoher, Chief of Air Service, in the form of a memorandum.

The report has not been issued for publication by the Chief of Air Service. Its appearance is expected to cause a greater sensation than that which occurred in the Air Service administration last spring when General Menoher warned General Mitchell to "speak softly."

Statements made by General Mitchell in his report are at considerable variance with the findings of the Joint Army and Navy Board which was appointed to report on the bombing experiments conducted with seacraft off the Virginia Capes last summer.

The outstanding statements in the Mitchell report are:

Aircraft can operate under conditions when seacraft is helpless.

Aircraft can safely protect the entire coast.

Seacraft should cease operations when within 200 miles the coast.

All naval activities should be confined to the high seas.

Had the army air service been permitted to attack as it desired, the seacraft attacked would not have lasted 10 minutes

The first provisional air brigade could have put out of action the entire Atlantic fleet in one attack.

The problem of destruction of seacraft by airplane is finished. It has been solved.

The scheme of national defense should be revised at once on the following basis: A department of national defense, with sub-secretaries for army, navy and air service; a department of aeronautics co-equal with the departments of war and navy must be created at once.

The report stated that at present there is a complete lack of liaison or system about our national defense. It scored the present coast defense

system, asserting that at least $1,870,000,000, had gone to create a coast defense that is little more than useless against hostile aircraft and hostile sea forces.

The report, as printed by *The New York Times*, says in part:

"Air forces with the types of aircraft now in existence or in development, acting from shore bases, can find and destroy all classes of seacraft under war conditions with a negligible loss to the aircraft. It is not necessary to destroy hostile seacraft at a distance greater than 25 miles off shore in order to protect the coast, as this distance exceeds the range of the most powerful guns at present installed. Aircraft, acting from suitable floating airdromes, can destroy any class of surface seacraft on the high seas.

"Conditions of weather affecting the air and sea conditions do not alter the statement made above, as aircraft can operate in conditions under which seacraft cannot operate. There are no conditions in which seacraft can operate efficiently in which aircraft cannot operate efficiently.

"The weapons used in the recent exercises against the seacraft were bombs alone. Torpedoes, gas, gunfire and mines were not employed. The army air service was not permitted to attack the targets, as it would under actual conditions, and never was more than one-tenth of the brigade employed in a single attack.

"Had the army air service been permitted to attack as it desired, none of the seacraft attacked would have lasted 10 minutes in a serviceable condition. The first provisional air brigade could have put out of action the entire Atlantic fleet in a single attack. The value of the airplanes in the first brigade did not exceed the cost of a modern destroyer."

General Mitchell then explains how battleships under war conditions are much more vulnerable than the targets used in the bombing tests. A battleship with full steam up and speeding ahead is a target much easier to hit and to put out of commission than the targets used, he asserts.

"The problem of destruction of seacraft by forces has been solved and is finished," the report goes on. "It is now necessary to provide an air organization and a method of defending not only our coast cities, but our interior cities against the attack of hostile air forces. Our recent maneuvers show an enemy having gained control of the air—which gives him control of the sea—may land air forces from airplane carriers on any of the islands or keys along our coast, which cannot attack by troops or artillery, and from those points launch air attacks against our great centers of population, extending even to Chicago, St. Louis and other Middle Western cities."

The report then explains how Chicago, St. Paul, Omaha, Kansas City and other cities in the Central West would be laid open to airplane attacks and their cities bombed with high explosives and the citizens killed with gas and incendiary bombs.

In conclusion, General Mitchell makes the following recommendations:

1. The establishment of an air force for frontier and coast defense.

2. The equipment of the navy for offenses on the high sea, and not for coast work.

3. Navy control should cease 200 miles from shore, protection of the land and the coast defenses being left to the army and the air service.

4. A more co-ordinate and working understanding between the different arms of the service. The present system, a heritage of our easly wars, has clearly demonstrated that the present lack of co-operation is a serious fault.

"In this connection," the report states, "an efficient solution of our defensive needs will not exist until a department of national defense is organized with a staff common to all services. Subsecretaries for the army, the navy and for the air service must be created."—*Aviation*, 26 September, 1921.

THE LESSON OF THE "ZR-2" DISASTER.—The two chief questions which, in connection with the accidental destruction of the rigid airship *ZR-2* (or *R-38*) come to the mind of the average person are:

1. What was the matter with the *ZR-2*?

2. Was her purchase by the United States Navy justified?

While it is yet premature, pending the findings of the official inquiry, to state with finality what caused the terrible disaster, it is not difficult to visualize what went wrong with the *ZR-2*. Statements by survivors seem to establish pretty definitely that the big airship broke in two not under the strain of full speed trials, as had first been assumed, but that the longitudinals snapped when the helm was put hard over. The commander of the dirigible, who was rescued, has declared that at the time of the accident the ship was making 50 knots—as against 65 knots "all out." On the other hand, another survivor, Lieutenant Bateman, states that just prior to the accident the ship had made turning tests, and that two turns had been managed without difficulty, but that on the third the vessel broke her back. His statement is particularly significant in view of the fact that he was able to observe the working of the rudders as he was seated in the stern cockpit, which is aft of the rudders.

So it becomes obvious that the ship was turned too suddenly for the speed at which she was flying, although this maneuver might have been totally harmless at a lesser speed.

This is still a further point to be considered: information reaching this country from men who were in close contact with the development and trials of the *ZR-2* shows that her control surfaces were overbalanced. That is to say, the balanced portion of the rudders was so large that they were extremely sensitive to air pressure, so that when the ship was under way a slight turn of the steering wheel would suffice to whip about the rudders. At high speed this would naturally cause a tremendous strain on the 700-feet-long framework.

It would therefore seem that the design of the *ZR-2's* rudders was faulty. This defect, which might have been easily remedied, would not have been a serious matter on a stronger ship. But the *ZR-2*, far from being a strong ship, was what one may call an "extra-light" vessel—a feature which borders on structural weakness. To understand the why and wherefore of the situation we must look at the history of rigid airship development, which takes us back to Count Zeppelin.

Germany launched her first "super-Zeppelin," a 2,000,000 cu. ft. vessel, in 1916, after fifteen years' experience in this branch of engineering, in which period she built some *sixty* Zeppelins ranging all the way from 400,000 cu. ft. to 1,250,000 cu. ft. In the fall of 1916 one such super-Zeppelin, the *L-33*, was brought down fairly intact in England and the British Admiralty instructed its airship designers to duplicate it. Up to that time British experience in rigid airship design and construction was limited to that obtained from a number of experimental ships that were being built after very incomplete drawings of pre-war Zeppelins. The British copy of the *L-33* called the *R-33* was only finished after the armistice, her trials taking place in the spring of 1919. Although the vessel embodied some improvements found in another captured Zeppelin, the *L-40*, which had come down intact in France, it should be pointed out that while the latter ship had a useful load of 39 tons, and the *L-33* one of 30 tons, the British copy of these 2,000,000 cu. ft. dirigibles had only a useful load of 24 tons. All of which is merely mentioned to show that a painstaking copy of an engineering structure will not necessarily be identical in all respects with the prototype—although they may *look alike*.

But while the *R-33* carried a smaller useful load than her German sisterships, she seemed to be in every way as strong as the latter. How strong the hull of these ships was, the *R-34* (sistership of the *R-33*) demonstrated at Mineola, Long Island, where for four days she withstood the buffeting by

winds, although on one occasion with the anchorage fitting of the main handling rope was pulled clean out of the framework.

The success of the *R-33* class airships prompted the British Admiralty in 1918 to prepare drawings for a much larger class of airships which were to be superior to the German *L-71* type. This was the ill-fated *R-38* (the *ZR-2*, as we call it) class, which incorporated numerous novel and original ideas. Now, it should be emphasized that when this class was *laid down*, all the experience the British had in rigid airship construction had been derived from copying German ships. The only firm which eventually was to produce a highly successful original design (Vickers, Ltd., with their *R-80*) had not by then emerged from the experimental period of their work; their experience was therefore unavailable.

And what may strike the reader as particularly odd, the Admiralty gave the contract for the construction of the *R-38* (or *ZR-2*) to Short Bros. of Bedford—*a firm that had never before built a Zeppelin type airship* and whose entire experience with rigids was obtained from the building of *R-31* and *R-32*, which were patterned after the *plywood-framed* Schuette-Lanz type.

Here then we have, in part at least, the answer to the question which heads this article: What was the matter with the *ZR-2*? *This ship was built in a factory that had no previous experience with duralumin airship construction, and to plans which were not based on practical experience.* To cite but one instance, the well-proven radial truss of the transverse frames was replaced on the *ZR-2* by a tangential truss system, the merit of which had yet to be demonstrated. In this connection I cannot do less but pay a respectful homage to the memory of the late Colonel Campbell, chief airship designer of the Admiralty, who had sufficient faith in his ideas to go up on the *ZR-2* during her several trial trips and who lost his life with the ship.

Knowing the circumstances which surrounded the construction of the *ZR-2*, we begin to understand why, as one report has it "several girders were strained in the factory when as many as thirty fitters crowded on them in the course of the assembly work." It is quite conceivable that workmen accustomed to the resiliency of plywood girders would do such a thing and that their foreman, not knowing any better, would not warn them. And a 700-foot airship is such a gigantic structure that the engineers familiar with the vagaries of duralumin—whom the Admiralty had detailed to the Short Works—could not personally supervise every detail.

For the sake of completeness it may be added that when Messrs. Short Bros. closed down their airship department, the Admiralty took over their factory and completed the *ZR-2*, whereupon she was handed over to the British Air Ministry.

That the hull of the *ZR-2* was structurally weak was first demonstrated on the inflation of the ship when, due to unequal load distribution, several girders buckled. The failing members were repaired, but during the first trial flight trouble was again experienced from several intermediate longitudinals and transverse frames, so that it became necessary to reinforce certain portions of the framework. Details are not available as to the exact nature of the stiffening work, but one might suggest that by reinforcing certain girders others may have been further weakened. Of course, this is merely a guess.

Judging however from all that has been said before it appears beyond a doubt that the *ZR-2 was* structurally weak—a condition brought about by the desire to carry the greatest possible useful load. This, as originally designed, was to be in excess of 50 tons, but it was subsequently reduced by the fitting of a bow mooring gear, not to speak of the reinforcement of the hull.

As to the second question we have placed at the head of this article: "Was the purchase of the *R-38* by the United States Navy justified?"—it would seem to the impartial observer that it was not.

Indeed, why should the government spend abroad $2,000,000 on a foreign-built, untried type of dirigible?

On the one hand the navy is desirous of developing rigid airships in this country. This cannot be brought about only through experimentation, and it will be admitted that if the necessarily heavy financial outlay has to be faced it will better serve its purpose if the money is spent here rather than abroad. American inventive genius is second to none in the world and can be relied upon to solve the problems of rigid airship construction just as well as it has solved other engineering problems.

On the other hand, if the Navy Department—which is in charge of rigid airship development to the exclusion of the army—wanted to have a ready-made airship of proven design, it would seem that it could have secured from Germany, without cost, by virtue of America's participation in the victory—a dirigible that would have been far superior to the *R-38*. This will be seen from the appended table which gives the chief characteristics of the *R-38* and of the *L-71*, Germany's largest Zeppelin, which was surrendered to Great Britain, while her sister ship, the *L-72*, was surrendered to France:

Type	Capacity cu. ft.	Length ft.	Dia. ft.	Total H. P.	Useful load (tons)	High speed miles per hour
R-38	2,720,000	695	85	2100	50(?)	75
L-71	2,420,000	745	79	1740	48	75

It is not generally known that while the war spoils of the United States include a great number of airplanes and engines, the lighter-than-air material of Germany was entirely divided up between Great Britain, France, Italy and Japan, the United States merely playing the rôle of a disinterested spectator. That this was a grievous mistake, will be readily conceded by all those concerned with the development of American airships.—*Scientific American*, 17 September, 1921.

SETTLEMENT FOR THE "R-38."—When the time comes to take up the matter of the financial adjustment incident to the wrecking of the *R-38* a proposal will be made to the British Government that one of the one time German dirigibles be turned over to the United States. Just how this suggestion will be received by the British cannot be contemplated, but the naval officers connected with aviation, particularly lighter-than-air craft, are hopeful it will bear fruit.

The British Government has three of the one time German airships. They were turned over to the British Government under the terms of the armistice.

They are much smaller than the *R-38*. One of them is only half the size, while two are about two-thirds the size.

The contract price for the *R-38* was $2,000,000, of which amount $1,500,000 had been paid to the British Government for the account of the manufacturers. Under the terms of the contract the United States was to pay half and the British Government half in the event of an accident.

Nothing has been done as yet regarding a financial settlement. The officers of the navy have felt that this matter could wait until the bodies of the victims had been buried.—*Aviation*, 26 September.

WHAT CRUMPLED UP THE "ZR-2?"—This is likely to be discussed for many months by engineers. The answer will have an important bearing on the future of aerial navigation. Few technical authorities have yet spoken. The daily press seems doubtful—the point of general agreement being that a disaster like that which befell the ill-fated dirigible is certainly not normal. Something was the matter. What was it? One of two voices, to be sure, may be heard to suggest that after all perhaps it could not have been otherwise, and to point to what they assert to be a fact—that no

German Zeppelin ever lived more than six months. Most writers, however, assume that the accident was avoidable, and the technical papers that have so far commented on it attribute it to structural weakness, which from one standpoint is reassuring, for that which is weak may be made stronger. An editorial writer in *The Engineering News-Record* (New York) declares that one or two of the numerous points of obscurity concerning the disaster should be cleared up soon. He writes:

"The first is the fundamental question of competence in the construction: Was every opportunity taken to apply the knowledge gathered from past experience? In other words, was the collapse the result of faulty or neglectful design, or does the accident truly represent insufficiency of existing knowledge? Next, but related to the preceding, is the question of whether this dirigible was planned on a scale so far beyond the range of past experience as to make the failure attributable to that fact itself. The danger of an abrupt change of scale of construction is known from many past experiences, and if excessive size is the secret of the present accident, there is less occasion for alarm. But in that event it becomes more surprising that 45 or 50 valuable lives were put at risk in a machine whose safety was still questionable.

"One fact of the disaster, in some respects its most damning feature, yet gives reason for a hopeful view as to the possibilities of the dirigible; the fact that the fall was due to a structural failure, not to defects of the lifting or driving equipment. If the constructors of aerial vessels have mastered all their problems other than structural, if they have made gas bags, machinery, and controls quite dependable, the outlook is bright, for nothing remains but to perfect the structural element of the vessel, and the road to this objective is a well-explored one. The loading must be determined, and thereafter it is only necessary to apply the resources of a well-developed art to obtain completely sound construction. The difficulties which lie in the determination of the loads may need to be approached by gradual steps; for the phenomena involved in the resistance of a slender bag structure hundreds of feet long to air forces are as indeterminate as those of wave loading on a ship's hull, and at the same time vastly more complex than the latter. But certain it is that every experience in aerial navigation will contribute to building up an increasing body of knowledge, leading constantly closer to the required certainty and safety.

"In the infinitely more difficult field of airplane construction, a truly wonderful degree of reliability has been attained—and this during a period much shorter than the history of lighter-than-air navigation. This result was achieved by ceaseless, undismayed work at the solution of the many baffling problems presented. Very much of the knowledge had to be gained at the cost of accident, but each accident was used as a step to fuller knowledge and sounder construction. If the only remaining problems of dirigible construction are of the structural kind, a simpler and more rapid development may be forecast.—*Literary Digest*, 24 September.

"ZR-2" MEMORIAL SERVICES IN WESTMINSTER.—Airmen of the United States Navy and the British Royal Air Force united September 7 in a service for the victims of the *ZR-2* disaster "amid the memorials of Great Britain's most illustrious dead," as one of the prayers expressed it, in Westminster Abbey.

Air Commander Maitland, D. S. O., and Commander Louis Maxfield, U. S. N., were especially mentioned in the official program, but among the mourners no distinction was made, and the wives of ordinary riggers and of scientific experts sat side by side in seats reserved for them. Ambassador Harvey, Vice Admiral Niblack, Rear Admiral Twining and Consul General Skinner were among the well-known Americans seated in the choir. Near them were representatives of the King and Queen, the British Cabinet and the naval, military and air forces. The Lord Mayors of London and Hull and the Mayors of Westminster and Bedford attended

in state, and a large number of British flying officers, with rows of ribbons worn by hard adventure worn across their tunics, also came to pay tribute to their fellow-aviators.

The general public filled every seat in the nave, hundreds being turned away disappointed. Just before the service began a detachment of sailors from the United States battleship *Utah* marched in. Near them was another group of American sailors of still more significance. They were all that are left of the crew of the *ZR-2*, men who were left behind at the Howden aerodrome as she started on her last cruise.

An address was read from the chancel steps by the Rev. H. D. L. Viener, chaplain in chief to the Royal Air Force. He described how the Americans and British air forces had been associated in developing "a once formidable engine of destruction into a pioneer of closer commercial relations," and dwelt upon the horror of the catastrophe when long months of training were over and only the eagerly awaited voyage home seemed to remain.

"The price of progress and the toll of science," he explained, "are bitter enough. Yet, thank God, there is never lack of splendid men ready to do and to dare. It is best so. To be in the forefront of the fight to conquer what half a generation ago was an untried field will ever appeal to our splendid manhood."

As he finished the choir broke into "Mine Eyes Have Seen the Glory of the Coming of the Lord," and never did the old battle hymn seem to come with more appropriateness. The service closed with prayers and a hymn which here is imperishably associated with trials, vicissitudes and triumphs of the great war, "O God, Our Help in Ages Past." Then, after the blessing, the congregation stood motionless as the bugle notes of "The Last Post," wailed through the lofty arches and the American and British national anthems were sung.

Secretary Denby has been advised that the British cruiser *Dauntless*, which is bringing home the bodies of the officers and men of the navy who lost their lives in the *ZR-2* disaster, will arrive in New York late on September 16, or early in the morning of the 17th.

The ship will dock at South Brooklyn and ceremonies will be held on the dock at 2 o'clock Saturday afternoon, September 17. All arrangements in connection with these ceremonies will be made by the commandant of the Third Naval District, Captain C. T. Vogelgesang.—*Aerial Age Weekly*, 19 September.

BOMBING TESTS OF THE U. S. S. "ALABAMA."—To enable the Army Air Service to pursue bombing experiments against warships supplementary to the tests conducted last June and July off the Virginia Capes, the Navy Department has turned over to the War Department the obsolete battleship *Alabama*.

The objects of the tests conducted with the *Alabama* are described in an Army Air Service communiqué as follows:

Objects of the Tests.—(a) To determine what explosive or gas effect is needed to put seacraft *out of action*. It has been demonstrated that seacraft may be utterly destroyed; but obviously, if the system of fire control, communication and mechanical installations of vessels can be disrupted and the nervous systems of the human beings who man seacraft can be shattered, the efficiency of the craft is destroyed without necessarily sinking it.

(b) To determine the effect of smoke bombs in concealing the attack of aircraft and of the effect of white phosphorous clouds in neutralizing anti-aircraft elements.

(c) To determine the effect of machine gun fire and fragmentation bombs in clearing the ship's decks of anti-aircraft units.

(d) To determine the feasibility and effect of night attacks on seacraft. There will be two distinct phases in the operation—the first, purely experimental in its nature to determine the effects of various auxiliary agents in the attack, the second, to consist of attack proper, simulating as nearly as practicable service conditions.

Location of Target.—Target will be located in Chesapeake Bay in the vicinity of the ex-*San Marcos*. Operations at the target will be controlled from the subchaser.

Board of Observers.—A Board of Observers consisting of three Air Service officers, two ordnance officers and two officers of the Chemical Warfare Service will inspect the results of tests and attacks on the battleship as indicated hereafter.

An advanced airdrome will be established near the target. A radio station will be established at that point by the communications section. The sub-chaser, one gig, and the *Sea Hornet* will be stationed at this airdrome during the operations for the purpose of transporting the Board of Observers and other visitors to and from the scene of the bombing, and for rescue work. During bombing the Board of Observers will be stationed aboard the sub-chaser.

Description of Tests and of Attacks.—In the preliminary tests a sufficient number of bombs and flares of all types will be dropped to determine the effect of each and the best method of tactical employment. It is anticipated that experiments with tear gas bombs will give important data on the attack of battleships by gas bombs. In similar manner the effect of phosphorous and smoke bombs will be determined. It is believed that smoke screens may be used with great effect in protecting the attacking airplanes from anti-aircraft defenses of seacraft. In order to determine this a series of tests will be held in which the various branches of aviation will make simulated attacks on the battleship through smoke screens.

Night Attacks.—The tactical effectiveness of flares in illuminating the attack of battleships will be determined in the preliminary tests as well as the effect of white phosphorus in outlining seacraft at night with sufficient distinctness to permit accurate attacks.

Tests will also be conducted to determine the effect of the 1100-pound armor-piercing bomb.

Upon the completion of the above-named tests an attack will be made on the battleship. This will be for tactical purposes and will employ the 1100-pound, 2000-pound and 4000-pound demolition bombs.

First Day. Tests with Chemical Agents.—In order to determine the effect of each of the following type of chemical bombs, tests will be made in the order listed below:

Tests	Planes	Type of bombs	Number of bombs
1	1-M.B.11	50-lb. smoke bomb, navy type	4
2	1-D.H.4B	25-lb. Mark I, phosphorous	4
3	1-M.B.11	100-lb. Mark II, phosphorous	4
4	1-M.B.11	50-lb. Mark III white phosphorous	2
5	2-D.H.4B	25-lb. Mark I, C & C T	16
6	2-M.B.11	50-lb. Mark I (lead lined) tear gas	8

In each attack one plane carrying the same number and type of bombs will accompany the attacking planes to the objective but will not release the bombs unless one of the planes is forced to abandon the mission.

Second Day. Smoke Screen Tests. In order to determine the best method of employing smoke screens with the various branches of aviation, experimental flights will be made by pursuit planes, light bombing planes, and heavy bombing planes. Only light bombs will, however, be used and

their effect on targets observed. List of tests in the order in which they will be conducted follows:

Tests	Planes	Type of bombs	Number of bombs
1	Fl. of 3 D.H.4B	50-lb. smoke bombs, navy type	12
	Fl. of 5 SE-5's	25-lb. Cooper bombs	20
2	Fl. of 3 D.H.4B's	100-lb. Mark I leaded with phosphorous	12
	Fl. of 3 D.H.4B's	50-lb. smoke bomb, navy type	12
3	Fl. of 3 D.H.4B's	50-lb. smoke bomb	12
	Fl. of 3 M.B.11's	100-lb. demolition Mark I	12
4	1 M.B.11	1110-lb. armor-piercing shell	1

Upon the conclusion of each test there will be an examination of the *Alabama* by the Board of Observers to determine the results obtained.

First Night. Tests of Illuminating Bombs and Flares.—In order to investigate the results of bombing at night and the illuminating effects of parachute flares and white phosphorous bombs as an aid in accurately locating the objective, the following tests will be conducted in conjunction with the dropping of illuminating flares and bombs.

Tests	Planes	Type of bombs	Number of bombs
1	1-D.H.4B	50-lb. Mark III (leaded with white phosphorous)	2
	1-D.H.4B	25-lb. Mark I, demolition	4
2	1-D.H.4B	Michelin flare, Mark I	4
	1-D.H.4B	25-lb. Mark I, phosphorous	4
3	1-D.H.4B	50-lb. Mark III (loaded with white phosphorous)	2
	1-M.B.11	100-lb. Mark I, demolition	8
4	2-D.H.4B	30-lb. Mark III (leaded with white phosphorous)	4
	2-M.B.11	100-lb. Mark I, demolition	12
4	1-D.H.4B	Michelin flare, Mark I	4
	1-D.H.4B	100-lb. Mark I, phosphorous	2
	1-M.B.11	100-lb. Mark I, demolition	6

Upon the conclusion of these attacks there will be an examination of the *Alabama* by the Board of Observers to investigate the results obtained.

Second Night.—On the second night an attack will be made for the purpose of destroying the *Alabama.* Following will be the order of attacks:

Attack	Planes	Type of bombs	Number of bombs
1	1-H.P.	4000-lb. demolition (if available) (successive attacks will be made by a single H. P.)	3
2	8-M.B.23	2000-lb. demolition	8

First Day of Tests.—The first day of tests (chemical agents) was September 23. The following particulars of these tests are reproduced by courtesy of *The New York Times:*

A fleet of planes from Langley Field poured a constant fire of chemical bombs on the ship, at .times hiding her completely from view in dense cloudes of white smoke and flooding her decks with tear gas.

At noon a Martin bomber flew by at 75 miles an hour, dropping four 100-pound phosphorus bombs, each of which struck squarely on the vessel. As the "eggs" hit the battleship the phosphorus splashed up and fell to the decks in gray clusters of spray. Flashes of flame glowed through the thick smoke, but were almost instantly obscured by a cloud of dense white fog.

The *Alabama* was hit on the after fighting top, on the bridge, just aft the forward turret and on the stern. For a long time flames burned the planking of the *Alabama's* deck, and when the army and navy observers went to view the effect upon the target the fire was still raging.

As no men were stationed on board the *Alabama* during this or any other test, the personnel of the ship was represented by wooden boxes at various posts. Practically every one of these was scarred and discolored by the phosphorus gas, showing that if the ship had been manned her officers and enlisted men would have been knocked out by the choking chemicals.

Besides phosphorus bombs, smoke bombs were used to show that a heavy smoke screen could be so dropped that it would entirely hide oncoming aircraft and also the target itself.

Still another experiment was conducted with tear-gas bombs. Three direct hits were made with bombs manufactured at Edgewood Arsenal especially for use during the Mingo Miners' war.

These contained only a 10 per cent mixture of tear gas for they were intended to frighten rather than to injure for a long period. The bombs were so drastic in their effect that forty-five minutes after they struck the vessel observers were unable to penetrate the ship without gas masks.

Night Bombing Test.—The night bombing test, September 23-24, resulted in several direct hits being made on the *Alabama* by attacking airplanes.

Sopwiths darted down at an angle of 45 degrees as they neared the vessel, and the airmen let loose their machine guns as in actual battle combat. The purpose of this was to destroy the morale of the attacked ship's personnel.

As they crossed over the ship from prow to stern the aviators dropped their demolition bombs in pairs. The gleaming missiles were easily seen as they fell through the air. Many struck in the water near the ship. One hit the forward turret and another the aft basket mast. Still another struck a searchlight and a fourth smashed the bridge to pieces.

The aviators seemed to gain better aim each time they returned to the target. At first they were inclined to shoot short of the vessel, but, learning the wind, they held their fire until close in at about a 200-foot range.

Following the Sopwiths came the four Martin bombers. The first dropped two of her 300-pound bombs in the sea beside the *Alabama* from a height of 1500 feet, but the third machine let go her two bombs directly on the forward deck. As the first bomb struck the prow of the *Alabama* a column of flame shot up.

This hit was considered a feat by the Air Service observers because the wind had shifted and the Martin bombers were crossing the target amidships, leaving a narrow target.

Second Day Test.—The second day test, September 24, started with nine *DH-4* Air Service machines laying a smoke screen across the windward side of the *Alabama*. Some of the smoke bombs did not ignite, but eight caught fire and a fan-shaped cloud arose which hid all the vessel except her bow.

This test was followed by bombing attacks with 300-pound bombs dropped by Martin bombers. One of these bombs hit on the bow of the ship and tore through her first deck, spreading the sides of the jagged hole upward so far that the guns of her forward turret would have been unable to sight above the wreckage.

The crew's quarters below this deck were demolished. A second bomb, dropped with the first, followed through the hole made by the first, causing more destruction.

In addition to the Martin bombers, a fleet of eight *SE-5* planes dropped thirty-two bombs, many of which struck the ship in vital spots. Her communication systems were shot away, her fighting masts badly damaged and some of her searchlights were put out of commission.

So terrific were some of the explosions that the battered *Alabama* tore loose from her anchor chains and drifted down toward the wreck of the *San Marcos* and the *Indiana*.

The next morning the ship was seen to be on fire, and mine sweepers made fast to the hulk and fought the fire back into the holds, where it was not believed it would accomplish much additional damage.

The Alabama is Sunk.—The final attack on the *Alabama*, on September 26, resulted in the ship being sunk by a 2000-pound demolition bomb.

The bomb tore off her mast, destroyed her superstructure and turned her over on her side in shallow water. Six other planes almost simultaneously rained 1000 and 2000-pound bombs on the hulk as she went down. Four hit the vessel as she trundled over and the remainder landed in the water within 20 to 30 feet.

The plane which gave the *Alabama* her death blow flew over the vessel and dropped a 100-pound sighting bomb. Her pilot then guided her back, and from observations taken the 2000-pound bomb was dropped in the identical spot where the sighting bomb hit—directly at the base of the mainmast.

The scoring by the seven planes participating in the final attack was 100 per cent, Air Service officers said.—*Aviation*, 3 October, 1921.

NEW ITALIAN AIRSHIP.—The French Government is reported to be investigating a new lighter-than-air flying machine which is under construction at Naples. Using no gas, it is based upon the principle of the lightness of rarefied air. By a variable exhaustion of air in a series of envelopes, levitation is obtained.

The machine is the invention of two Italians, Vaugeau and Gargiulo. They do not form anything like a perfect vacuum, but by a system of enclosed reservoirs, the center one of which has the greatest rarefication, they say that they have obtained the result that the pressure of the outside atmosphere is lessened to a degree which makes the frail envelope practicable.

There are three features of the construction. The first is a double envelope one part with another. In the outside envelope an atmosphere of seven-tenths is maintained, whereas in the center envelope the air is much more rarefied. The layer of seven-tenths atmosphere weakens the outside pressure upon the interior of the balloon, which exercises the levitation force.

The second feature is a series of hollow beams forming the frame of the machine, through which compressed air circulates in a manner to exert a counteracting pressure against the outside atmosphere.

The third feature makes use of air heated by the motors to obtain a further decrease of the outside pressure.

Professor Garuffa, an Italian expert, holds that the new machine means a revolution in flying. It will do away with the expense of the use of hydrogen and, it is said, will greatly reduce the crews needed.

The inventors say that the machine when perfected can make 350 miles an hour with 750 horsepower.—*Aerial Age Weekly*, 19 September, 1921.

BRITISH AERIAL TRANSPORT.—A type of aircraft which is quite new in some of its features is being constructed at Bristol for the government.

In describing it a *Daily Mail* correspondent says: Viewed even from a distance the colossus looks astonishingly large. Seen close at hand, with the framework of its tiers of wings, as yet uncovered, stretching one above another on either side of its tremendous hull, the machine almost takes one's breath away.

Gone is the day of aeroplanes as we have pictured them hitherto. This machine wants a new name. Its body makes one think of the slim lines of a speedy sea vessel. Then, when you are inside it, the impression is rather like that of some Pullman-car express on a glorified scale. But it is not

really like a ship or any earth vehicle. Those working on it merely call it an "aerial transport."

It may be used to carry troops. It is big enough to act as a tender for a squadron of aeroplanes, carrying fuel and spare parts for them. It may be fitted up as a Red Cross craft of the air and have its lofty main saloon equipped as an opearting theatre.

Concentrated Power Units.—There is an engine-room inside the monster's hull. Banished here at last is that "amateurish" scheme of dotting motors with their propellers out somewhere on wings where they are inaccessible. Here there is a battery of engines, with their many gleaming cylinders, grouped in orderly precision; and—what makes the expert pause—such a system of gearing and power transmission as has never been fitted to any flying craft before.

It is from this engine room that the power will be transmitted to propellers on the wings; and if the experiment succeeds it will open up a completely new field. There is talk, for instance already, of obtaining a number of the huge 1000 h. p. aero engines now reaching perfection and using them for an enormous craft which may surpass our wildest dreams.

This Bristol giant will fly by night and day. The peril of forced landing—that bugbear of the aeroplane—is practically eliminated. If any portion of the power-plant gives trouble there will be mechanics in the engine room to put it right while the machine is in the air, the other working units being accelerated meanwhile to give the power sufficient to maintain altitude and speed.—*Naval and Military Record.*

THE PARSEVAL SEMI-RIGID AIRSHIP "PL-27."—The development of the German non-rigid *PL* airships occurred between 1906 and 1917. These two letters stand for "Parseval Luftshiff." The Parseval airships are all built according to the patents of Major August von Parseval, Dr.-Engineer, by the Luft Fahrzeug Gesellshaft (L.F.G.) at Berlin and Bitterfeld. That the Parseval airships were successful is attested by the fact that they were used before the war in Austria, England, Italy, Russia, and Japan.

Since 1913 all Parseval airships were constructed with envelopes having the Parseval patent trajectory band system of car suspension, which is a very efficient system of non-rigid construction. The *PL-27*, built during 1916, is in reality a semi-non-rigid, although classified in Germany as a non-rigid one. Within the envelope of this ship there is a V-shaped keel extending almost the entire length of the aircraft and containing the narrow runway or "catswalk" common to all large airships of the Zeppelin or rigid type. Forward, beneath this, is the navigating car or gondola, while immediately behind it is the first power car in a central position. In the center of the dirigible, on each side of the keel, are two power "eggs" or cars similar to those used on the later types of Zeppelins. At almost the extreme aft end of the keel is located another power car. All of the power cars are carefully streamlined. The gasoline tanks and water ballast bags are located on each side of the runway, the same as in rigid airships. *PL-27* is the largest "semi-non-rigid" airship built to date, and her performances have been extremely good, especially as regards useful load and speed. Nothing has heretofore been published about the carefully-guarded development of this type of ship that took place in Germany during the late war.

The interesting and important main dimensions, weights, performances, etc., are as follows:

Capacity, 1,000,000 cubic feet; length over all, 518 feet; diameter, 64.3 feet; total load, 74,700 pounds; useful load, 30,600 pounds; number of engines, 4; make of engines, Maybach; total horsepower, 960; propellers, 4 two-bladed of wood; speed, 72 miles per hour.

Account must be taken of the complexity of a non-rigid airship of such dimensions. It has the advantage, however, of not being so liable to break its back, or certain girders thereof, as happened in the case of the

ZR-2, with such unfortunate results. If, instead of prohibiting experimentation of any sort with airships by Germany in the Versailles Treaty, the United States had allowed construction and experiments to continue to a certain limited extent, she would undoubtedly have benefited thereby in her new policy of aircraft construction, as proper tests of *PL-27* would probably show her to be superior to the Zeppelins as regards economy and useful weight lifted, although at present the latter type of airship is considered in Germany to be better for long-distance transportation.—*Scientific American*, 1 October, 1921.

LIEUT. MACREADY SETS NEW ALTITUDE RECORD BY FLIGHT OF 40,800 FEET AT DAYTON FIELD.—Lieutenant John A. Macready, a test pilot at McCook Field, to-day shattered the world's altitude record, attaining a height of 40,800 feet in the same La Pere biplane used by Rudolph C. Schroeder, who set a record of 38,180 feet on February 28, 1920.

Lieutenant Macready was in the air 1 hour and 47 minutes, requiring all but a few minutes of the total flying time to reach his mark. At 39,000 feet ice formed on his oxygen tank, but he pressed on until the altimeter registered 41,000 feet. At this point his engine coughed and died. He then glided safely to the ground.

Macready's new record is 2620 feet higher than that of Schroeder, and in this flight the pilot suffered none of the hardship met by the former chief test pilot. Schroeder's eyeballs froze and excessive dilation of the heart kept him in a hospital nearly two weeks after the flight. On landing Macready declared he suffered only from numbness. He climbed out of the plane unassisted and posed for photographs.

Lieutenant George B. Patterson, chief of the technical data section of the field, took charge of Macready's instruments, and following calibration announced the official altitude as 40,800 feet.

Macready was clothed in the heaviest furs with special helmet and goggles. To insure clear vision a special gelatin was used on the goggles to prevent collection of ice. The suit was electrically heated throughout.

A centrifugal air compressor operated by a gas turbine forms the supercharger which made the flight possible. The turbine derives its power from the hot exhaust gas of the Liberty motor with which the ship is equipped, and air thus compressed is fed to the carbureter at the same pressure as air at sea level.—*New York Times*, 29 September, 1921.

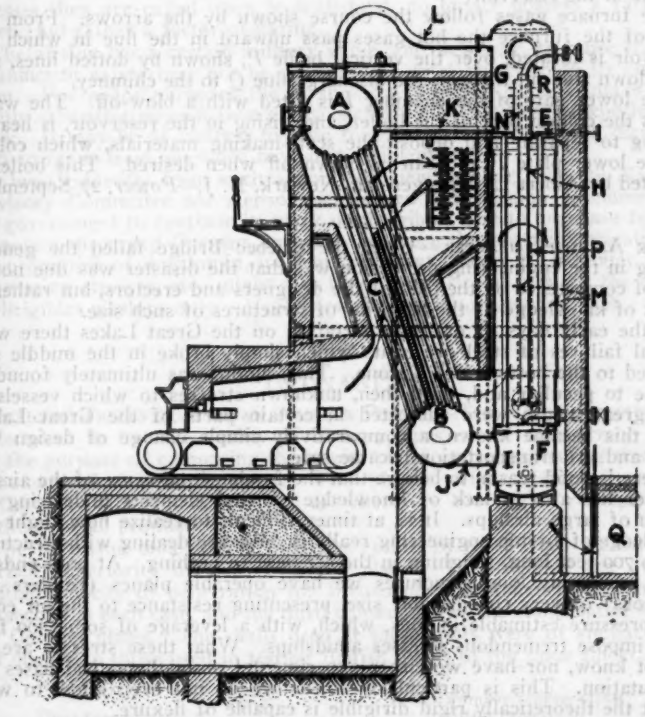
NAVIGATION AND RADIO

THE VOYAGE OF THE "QUEST."—It is possible that the voyage of the *Quest*, under Sir Ernest Shackleton, may lead to a substantial addition to the sum of knowledge of the conditions obtaining in the upper air. Sir Ernest recently offered his services to the British Air Ministry to carry out meteorological observations and to gather topographical information during his forthcoming expedition to the Atlantic, Southern and Indian Oceans. The *Quest* has been furnished with instruments and equipment necessary for carrying out observations, and she has been constituted an official reporting ship to the Meteorological Office. She has also been supplied with photographic apparatus and with kites similar to those employed in the investigation of the upper air over the Atlantic during the voyage of the steamship *Montcalm* prior to the flight of *R-34* in 1919. It is further proposed to take records of the temperature and pressure of the upper air by using a seaplane which is to accompany the expedition. As the ship will, among other places, visit the islands of St. Paul's Rocks and Tristan d'Acunha, in the Southern Atlantic, some valuable data should be collected. The first of these groups lies on the route which would probably be followed by aircraft flying via a position almost midway between South America and South Africa.—*Aerial Age Weekly*, 30 September, 1921.

WIRELESS DIRECTION SERVICE ON BRITISH COLUMBIA COAST.—The first modern device for directing steamers by wireless on the British Columbia Coast has been erected at Tatoosh, and is now in operation. All shipping masters are invited to make full use of this apparatus by which, it is claimed, steamers can be directed in a fog as easily as they can find their way in broad daylight.—*Nautical Gazette*, 1 October, 1921.

ENGINEERING

BRUEGGERMAN WATER-TUBE BOILER.—The feature of the Brueggerman water-tube boiler is a water-storage reservoir that is connected with the drums of the generating part of the boiler. The upper part of the reservoir is utilized as a steam dome. The water of circulation passes through the main chamber of the reservoir, and the gases of combustion pass around it.



The generating part of the boiler consists of the upper and lower drums *A* and *B*, which are connected by a bank of inclined tubes *C*. Water is supplied to the drum *B* from the vertical cylindrical reservoir, which is divided by the tube plates *E* and *F* into three compartments, the upper one, *G* serving as a steam dome. The center portion as a water reservoir, and the lower chamber *I* connecting through the nozzle *J* with the lower drum *B*. The drum *A* is connected to *G* by the pipes *K* which are arranged below the water line. The steam space of the drum *A* is connected by the pipes *L* with the steam space of the chamber *G*. Tubes *M* extend from the upper

plate *E* through to the corresponding lower plate, and serve to carry the water of circulation.

The feed water enters through the pipe *R* and discharges from the tube *H* just above the plate *F*. It then rises and passes to the pipe *N* overflowing to the horizontal plates that are arranged around the pine *N* in step fashion. As the hot water rises through the pipe *N* it overflows on the plates, which breaks up the hot water and frees the air.

Circulation of the water from the drum *A* through the pipes *K* to the lower part of the steam drum *G* and downward through the tubes *M* through the nozzle *J* and tubes *C* to the drum *A*. The hot water in passing downward through the tubes *M* heats the water in the storage reservoir and this water will be heated also by the flue gases which pass around the outside of the reservoir.

The furnace gases follow the course shown by the arrows. From the back of the furnace the hot gases pass upward in the flue in which the reservoir is located, over the vertical baffle *P*, shown by dotted lines, and then down and out through the discharge flue *Q* to the chimney.

The lower part of the chamber *I* is fitted with a blow-off. The water enters the coldest part of the boiler, and, rising in the reservoir, is heated, serving to separate and deposit the scale-making materials, which collect on the lower plate *F* and can be blown off when desired. This boiler is patented by Albert L. Brueggerman, Newark, N. J.—*Power*, 27 September, 1921.

THE AIRSHIP DISASTER.—When the Quebec Bridge failed the general feeling in the engineering profession was that the disaster was due not to lack of competence on the part of the designers and erectors, but rather to a lack of knowledge of the behavior of structures of such size.

In the early days of ore transportation on the Great Lakes there were several failures of steel ore boats which simply broke in the middle and plunged to the bottom like a stone. This, again, was ultimately found to be due to peculiar and, until then, unknown stresses to which vessels of such great length were subjected in certain parts of the Great Lakes. Once this became known, a comparatively simple change of design was made and ore transportation became safe.

There is good reason to believe that the fundamental cause of the airship disaster lies also in lack of knowledge of vital elements underlying the design of large airships. It is, at times, difficult to realize how slight our knowledge of airship engineering really is. We are dealing with structures 600 to 700 feet long, weighing in the air next to nothing. At both ends of these immensely long structures we have operable planes (rudders and elevators) of very considerable size, presenting resistance to the air equal to a pressure estimable in tons, which, with a leverage of some 300 feet, must impose tremendous stresses amidships. What these stresses are we do not know, nor have we either experimental or mathematical bases for computation. This is particularly so, as we do not even know to what extent the theoretically rigid dirigible is capable of flexure.

Such a situation would have been bad enough if we were dealing with materials with whose behavior we are familiar, but we are not. The main resistance parts of the dirigible are constructed of the so-called "duralumin"—an alloy of aluminum and copper, or aluminum and zinc, or all three of them. Duralumin is, however, a new alloy, practically a "war baby," and we have only scant knowledge as to its behavior and next to no knowledge as to its ability to withstand repeated stresses—something of particularly great importance in a structure that is vibrating like a string all the time. In airship design we have therefore to meet unknown stresses with a material of unknown qualities, which would be bad enough in itself but is stupendously aggravated by another circumstance, and that is the very low factor of safety employed in airship construction.

In a bridge, an ore boat, an automobile, generous factors of safety are used wherever there is doubt as to the stresses to which a member is likely to be submitted, because there is no vital gain outside of the cost consideration, which should be secondary in using excessively light members. But this is not so in an airship. If the latter is designed to fly across the Atlantic it must carry a certain weight of gasoline, oil and useful load, and every pound of these supplies reduces by a pound the weight of the metal that can be put into the structure, and hence the factor of safety, with the result that members one-sixteenth to one-eighth of an inch in thickness are by no means uncommon in dirigible construction; and members of such slender dimensions in duralumin, under the tremendous stresses they are called upon to withstand, no longer possess a factor of safety, but rather a factor of daring.

The airship has a certain military value, and in a war structure the lack of sufficient safety may not be considered a vital objection to its employment. For peace purposes the airship can probably be also made sufficiently safe after enough time and money have been spent in experimental work. It may be of interest to note that out of about fifty big dirigibles built so far at least one-third have met a violent end.

It was evidently from such a point of view as that, that the National Advisory Committee for Aeronautics passed a resolution recommending the government to continue its work on dirigibles, and to purchase for this purpose a discarded German Zeppelin. A more thorough investigation of the properties of duralumin, its heat treatment, "ageing," behavior under alternating stresses, etc., might also be of interest, and not for the design of dirigibles airships only.—*Mechanical Engineering*, October, 1921.

ORDNANCE

OFFICIAL TRIALS OF GERMAN ARMOUR PLATES.—Trials have recently been undertaken to test the quality of various types of German armor plates for the purpose of comparing them with plates of corresponding thickness manufactured in this country. The plates were obtained from the ex-German battleship *Baden*, and are therefore thoroughly representative of the German product.

The following table setting forth the results of these trials indicates the marked superiority of British armor plates. In the table the average limiting velocity of penetration for British plates is taken to be 1000 feet per second in each case, and the third column shows the comparative figures for German plates. The shells used at these trials were of similar mark and quality to those used in testing British plates of the same thickness.

Thickness of plate in lb. per sq. in.	Index number representing limiting velocity of penetration	
	British	German
80 Bulkhead plate	1000	1000
160 Turret roof plate	1000	Less than 955 *
200 Turret roof plate	1000	Less than 935 *
320 K. C. armor	1000	940
400 K. C. armor	1000	Less than 895 *
480 K. C. armor	1000	Less than 835 *
560 K. C. armor	1000	915

*In these cases owing to the limited space available for attack, the velocities could not be taken low enough to determine the limiting velocity, the shells, at the velocities indicated by the index figures, passing on practically undamaged, except in the case of the 200-lb. roof plate.

—*Engineering*, 16 September, 1921.

BRITISH NAVAL CORDITE.—Questions were asked recently in the House respecting the sum of £106,700 which is being spent on plant for the treatment of cotton silver at Holton Heath cordite factory, near Portland. As the Admiralty will now supply their own cordite from this place, it is intended that all work connected with its production should be concentrated there. During the war risks had to be taken which were unavoidable in the circumstances, and the navy has not the confidence that it ought to have in its cordite at the present time. Hence the anxiety of the Admiralty to have the bleaching and cleaning of the cotton used under their own supervision.—*The Marine Engineer and Naval Architect,* September, 1921.

ARMY EXPERTS DEVELOP FLASHLESS POWDER, WHICH ENABLES FIRING AT NIGHT WITHOUT LIGHTS.—Flashless gunpowder, making possible night firing without illumination, one of the recent developments of the Army Ordnance Corps, will be demonstrated at the third annual meeting of the Army Ordnance Association at the Aberdeen proving ground.

Since the invention of smokeless powder, which eliminated the location of guns in daylight, ordnance experts have been working to prevent similar "spotting" at night. This has been accomplished, it was learned to-day. Night firing with guns as large as five-inches have recently been conducted with no more than a momentary dull red glow.

This has been accomplished by introducing substances into the powder which when the gun is fired are volatilized, diluting and cooling the hot inflammable gasses. Salt and chlorine of potash, it is said, are two substances used to eliminate the flash.

Other features of the program include the firing of the "heaviest single unit of ordnance in the world," the recently perfected 16-inch 50-caliber gun mounted on a disappearing carriage. The gun measures 69 feet in length, weighs 340,000 pounds, and requires 850 pounds of smokeless powder to propel its 2400-pound projectile approximately 22 miles.

Another rifle of the same type has been mounted on a barbette carriage, permitting an elevation of 45 degrees, and is expected to have a greater range than any gun now carried by naval craft.

A new and enlarged Browning rapid-fire gun of .50 caliber intended for defensive use against aircraft and tanks will be demonstrated. The ammunition used by this weapon is twice as large as that used in the World War and the rate of fire has been greatly increased.—*New York Times,* 5 October, 1921.

MISCELLANEOUS

THE SPANISH NAVY.—We have not heard much about the Spanish Navy during the troubles of that country in Northern Africa. Probably this is principally due to the fact that the Moors are not giving warships much opportunity to take a hand in the fighting, and that the services of these, therefore, are not of an active character. Whilst the navy of Spain is only a very minor force as sea armaments are measured these days, it is unquestionably stronger and more efficiently organized at the present time than at any period of its modern history.

The program to which this result is due was framed in 1913. It provided for an expenditure of about £11,000,000, a large proportion of which was to be devoted to the development of the naval dockyards. This work, however, does not appear to have made much progress. Since the war the program has been revised and extended and is now in steady course of materializing. Two additional light cruisers, of 5590 tons apiece, have been added to the list of new construction, together with six destroyers, twenty-eight submarines, and three gunboats. The Spanish naval authorities are manifestly impressed with the great defensive value of the mine,

and they are forming big depots of these weapons, and adapting ships for laying them.

Distinctly the most interesting feature of recent Spanish naval programs has been the disposition to build vessels of a larger size than heretofore. Three battleships have been completed at Ferrol, the *Alfonso XIII*, *Jaime I*, and *Espana*, and two more of a similar type are to be built. These vessels, in point of design, may be classified as minor dreadnoughts. Of 15,460 tons displacement, they carry eight 12-inch guns in four turrets, the midship pair being echeloned, but in such a manner that all the weapons can be fought on a very wide arc of fire.

The speed of these ships, which are propelled by Parsons' turbines of 15,300 s. h. p., is barely 20 knots. Their armor protection is very inadequate; the broadside belting is of 9.4 inch Krupp steel, and the heavy gun turrets are of 10 inch, of the same material. Whilst these Spanish battleships appear to embody the maximum value in collective qualities for their displacement (for they are only 460 tons bigger than our London class), they are assuredly less useful than had they been much faster and more lightly armed; for, as battleships, they are so hopelessly outclassed nowadays that their definition becomes little more than a misnomer. But, as armored cruisers of the same tonnage, they might have been really valuable ships. It is the old story of crowding too much weight of armament into a hull, to the sacrifice of other essential features, so that her resultant low standard of tactical mobility gives her very slender prospects of deriving any advantage from her hard-hitting power.

In their light-cruiser designs the Spanish naval authorities show this same disregard for the essential quality of speed. The *Reina Victoria Eugenia*, launched at Ferrol in 1920, is only good for 25 knots, although she displaces 5590 tons. The *Reina Augusta Victoria*, of 5778 tons, launched subsequently at the same port, will probably prove a little faster. Three more cruisers of the same type are in hand.

In our own *C* class (or, more strictly speaking, classes) of light cruisers we get a speed of 29 knots on displacements ranging between 3750 and 4190 tons. The *Reina* type carry nine 6-inch guns; the *C* group five 6-inch guns. We fancy that the five knots extra speed of the British ships would more than compensate for the lesser number of guns in a running action—and the tactics of all modern naval battles are of this character.—*Naval and Military Record*, 14 September, 1921.

SPANISH SUBMARINES.—The Spanish Minister of Marine announces that Spain has ten submarines ready for service. The government intend to purchase eighteen others shortly.—*Army and Navy Gazette*, 17 September, 1921.

THE INDUSTRIAL SITUATION IN ITALY.—Every effort was made by the Italian Government to avoid the closing of the dockyards at Trieste that had been threatened for some time as a result of the abolition of the subsidies arranged through the Nava decree. The Minister of Industry has arranged a subsidy of 600 lire per ton, which will be granted in the case of ships that were one-quarter constructed on June 30, 1921. Twenty-eight ships will benefit in this way.—*Engineering and Industrial Management*, 15 September, 1921.

AUSTRIAN MERCHANT FLAG.—According to an official decree the flag which is to be used in future by Austrian merchant ships is to consist of three horizontal stripes of equal width of which the middle stripe shall be white and the upper and lower stripes red. The height of the flag in relation to its breadth shall be as two is to three.—*The Nautical Gazette*, 24 September, 1921.

THE RUSSIAN NAVY.—Even the Soviet Government apparently believes in the Cromwellian doctrine of keeping your powder dry. The Red Army, of course, is chiefly maintained for the purpose of supporting the present régime, and it is more for the purposes of political distraction at home that it is employed on other adventures. The Russian Navy, not being necessary in this rôle, has been allowed to lapse into a condition of neglect and disorganization without precedent in the history of fighting fleets. But apparently an awakening is taking place, and the Soviet Government is beginning to realize that sea power cannot wholly be left out of its calculations.

This, at any rate, is suggested by the negotiations which Russia has opened with a view to regaining various ships of which the British Navy took possession during 1918. These consist of several ice-breakers, which are indispensable auxiliaries to the Russian Baltic fleet, and the five-funnelled cruiser *Askold*, which was such a familiar occupant of Mudros Harbor during the Dardanelles operations. It is very difficult to form any idea of Russian naval strength from a reference to the official text-books, because, although some very formidable dreadnoughts were building when the war broke out, there is no data as to the stage of progress reached in most of these, whilst the condition of dilapidation of the older ships of the fleet renders it impossible to even approximately assess their fighting value.—*Naval and Military Record*, 15 September, 1921.

THE DUTCH SHIPPING COMBINE.—It is not quite clear how far the arrangement between the principal Dutch companies is an amalgation of all interests. The reports speak of their pooling their surplus tonnage. But as the capital of the new organization—which is to be called the United Netherlands Steam Navigation Company—is to be no less than ten millions sterling, it is clear enough that it is to be a very big thing. Moreover, the fact that the companies concerned are thus brought into so close a relationship will make it certain that, whether actually amalgamated or not, they will hereafter work in close union. The *raison d'etre* of the operation seems to be a recognition of the fact that at the present time there is not enough profitable employment for all the ships owned by the constituent companies on the routes which they have hitherto traded. They accordingly propose to open up new routes in directions not previously served by them, wherever inducement seems to offer. The six companies concerned are (1) the Royal Netherlands Steamship Company; (2) the Steam Navigation Company of the Netherlands; (3) the Holland-America Line; (4) the Rotterdam Lloyd; (5) Messrs. Phillip van Ommeren; and (6) Messrs. van Nieveldt Goudriaan and Co. The Chairman of the combine is Mr. van der Houven van Dort.—*The Marine Engineer and Naval Architect*, September, 1921.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Water Treatment for Boilers. *Mechanical Engineering*, September, 1921.

Reduction Gears for Ship Propulsion. *The Shipbuilder*, September, 1921.

Direction Finding Wireless. *Engineering*, 2 September, 1921.

Electric Propulsion of Ships. *Engineering*, 2 September, 1921.

Coastal Operations. *Journal of the United States Artillery*, September, 1921.

Some Applications of Physics to Ordnance Problems. *Journal of Franklin Institute*, September, 1921.

Lessons for Marines from the Gallipoli Campaign. *The Marine Corps Gazette*, September, 1921.

NOTES ON INTERNATIONAL AFFAIRS

FROM SEPTEMBER 10 TO OCTOBER 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

WASHINGTON CONFERENCE

MINOR POWERS INCLUDED.—After consultation with other nations taking part in the conference at Washington, the United States Government on October 4 extended invitations to the Netherlands, Belgium, and Portugal to take part in the conference so far as it concerned the Far East. Belgium was included largely because of her part with the Allies in the war, and the Netherlands and Portugal because of their Pacific colonies and interests. It was decided that only the five principal nations should deal with the question of armaments.

AGENDA OF CONFERENCE.—Early in October the U. S. State Department published the following tentative agenda which had been proposed to the nations concerned:

Limitation of Armament.—One—Limitation of naval armament, under which shall be discussed (a) basis of limitation, (b) extent, (c) fulfillment.

Two—Rules for control of new agencies of warfare.

Three—Limitation of land armament.

Pacific and Far Eastern Questions.—One—Questions relating to China.

First—Principles to be applied. Second—Application.

Subjects:

(a) Territorial integrity.

(b) Administrative integrity.

(c) Open door—equality of commercial and industrial opportunity.

(d) Concessions, monopolies or preferential economic privileges.

(e) Development of railways, including plans relating to Chinese Eastern Railway.

(f) Preferential railroad rates.

(g) Status of existing commitments.

Two. Siberia. (Similar headings.)

Three. Mandated islands. (Unless questions earlier settled.)

The powers addressed, it was intimated, were aware of the range of matters in the proposed agenda, and there was no possibility that any of the foreign governments would have any misapprehension concerning the scope of the questions. The object of this government in preparing the list of topics was to so arrange and state them that any matters pertinent to the specific subjects might be discussed without limitation in advance, which might make consideration of some questions impossible. As the agenda stand, there is no limit on any question that is suggested for consideration.

PERSONNEL OF DELEGATIONS.—The Japanese delegation to the Washington Conference was headed by Prince Tokugawa, President of the House of Peers, and included Baron Kato, Minister of the Navy, and Baron Sidehara, Ambassador to the United States.

The French delegation, it was announced unofficially in October, would consist of Premier Briand, M. Viviani, Senator Albert Serraut, General Berthelot, Marshal Foch, and Admiral Grasset of the Navy General Staff.

Advices from England indicated that there would be six British representatives, including three from the overseas dominions. George Foster Pearce, Australian Minister of Defence, was designated to represent Australia. In case Premier Lloyd George was unable to attend, the English delegation was expected to include Mr. Arthur Balfour and the First Lord of the Admiralty, Lord Lee.

CHINA REJECTS SHANTUNG PROPOSALS.—With the idea, it was thought, of keeping the question out of the Washington Conference, Japan in September made proposals directly to China for the restoration of Shantung.

As published by the Japanese Foreign Office on September 16, these proposals appeared to promise practically complete surrender of Japanese control, except with reference to the Shantung Railway, certain mines in which Japan stipulated joint operation, and public buildings and property at Kiao-chau. It was stipulated that Kiao-chau and some other ports should be opened on equal terms to all nations.

On October 7 China published her rejection of these terms, declaring that the Japanese offer was fundamentally unacceptable, and presenting detailed objections to the proposals made. The policy of China was apparently to avoid separate negotiations in order to be able to raise the Shantung question at Washington.

JAPAN'S NAVAL POLICY.—Tokio, Sept. 13 (Associated Press).—A conference of the naval and military authorities and the officials of the Foreign Office has decided upon the following basic principles as the limitation of naval armament, according to the Asahi Shimbun:

"Japan has no intention of reducing the strength of her navy independently, nor of suspending the previously arranged building program. But as she has heartily approved curtailment, so as to promote the happiness of mankind, Japan is willing to make efforts to establish some arrangement with the powers.

"Japan believes, first, that it is against the fundamental spirit of the Washington conference that any power should possess superior forces sufficient to secure a decisive victory over any other power or powers; therefore the powers should minimize the scope of armament to the same degree as that of the country having the smallest naval strength among the powers concerned.

"Second, the powers concerned shall not establish any naval base or make any arrangement to serve as naval bases for their navies on the Pacific."

Concerning the second provision, the Asahi Shimbun says that the naval officers originally suggested that fortified islands in the Pacific should be prohibited, but this was amended as above.

Furthermore, continues the paper, Japan wants to suggest that limitation should be put on future warship construction after a certain year, to be named, because destruction of existing warships or suspension of construction on those building would involve inconvenience. Also the

period for the completion of previously planned vessels should be extended. For example, it is pointed out, the United States should extend her three-year program over a longer period, thereby regulating the augmentation of her naval strength.

UNITED STATES AND LEAGUE OF NATIONS.—Geneva, Oct. 2.—Great Britain and France will raise at Washington the question of the adherence of the United States to the League of Nations. If this comes as a surprise to the Washington Administration it is nevertheless the decision the London and Paris governments have reached.

They do not consider that it will be necessary to add any item to the existing agenda of the November conference, but will bring up the League under the discussion of disarmament, and particularly land disarmament. It is understood that the initiative will come from the British representatives at Washington.

The line of reasoning the Allied delegates will probably offer is that so far as land disarmament goes agreement of the great powers to disarm by no means solves the problem. England and France feel that possession of top-heavy military equipment by small states constitutes as great, if not greater, danger to peace than possession of large armies by the big powers with more poise and more to lose by rushing into war. Quarrels of little nations embroil big nations and thus many a war in history has grown to formidable proportions.

Therefore, they argue, real disarmament must be all embracing and the best if not the only means to assure that it is through the League of Nations for which the small nations have such enthusiasm.

It will probably be pointed out that the successful Republican campaign in America against the League was based most largely upon criticism of the Covenant and not upon the idea of an international association. But thanks to interpretations and constructions put upon it little now remains of the Covenant except the idea.—*N. Y. Times*, 3/10.

LEAGUE OF NATIONS

ESTABLISHMENT OF WORLD COURT.—The election of judges for the permanent Court of International Justice, as announced from Geneva on September 14, resulted in the choice of the following eleven members: Viscount Robert Bannatyne Finlay, of Great Britain; Charles Andrè Weiss, of France; Dionisio Anzilotti, of Italy; John Bassett Moore, of the United States; Rafael Altamira y Gravea, of Spain; Senator Ruy Barbosa, of Brazil; Antonio de Busttamente, of Cuba; Max Huber, of Switzerland; B. C. J. Loder, of Holland; Didrik Galtrup Gjedde Nyholm, of Denmark; Yoruzo Oda, of Japan.

The four deputy judges selected were Messrs. Negulesco, of Rumania; Wang, of China; Yovanitch, of Jugoslavia, and Beichmann, of Norway. It was arranged that the judges should meet in October at Geneva for organization and election of a president of the court.

WORK OF LEAGUE ASSEMBLY.—The Second Assembly of the League of Nations met at Geneva on September 6 and closed on October 5. Among the matters taken up at the conference may be noted the following:

New Members Admitted.—Latvia and Esthonia were admitted to membership in the League, bringing the total to fifty members. The application of Lithuania was held up pending her acceptance of the League settle-

ment of her dispute with Poland. That of Hungary was left until the next session.

Amendments Made Easier.—The process of amending the Covenant of the League was made somewhat easier by changing Art. XXVI to read as follows:

"Amendments to the present Covenant, the text of which shall have been voted by the Assembly on a three-fourths majority in which there shall be included the votes of all the members of the Council represented at the meeting, will take effect when ratified by the members of the League whose representatives composed the Council when the vote was taken and by a majority of those whose representatives formed the Assembly."

Expenses Apportioned.—The committee assigned to distribute the cost of the League establishment divided the members into groups, Great Britain and France paying 9.2 per cent each; China, India, Italy, and Japan, 6.65 per cent; Spain, Argentina, Brazil, Rumania, Jugoslavia, and Czechoslovakia, 3.58 per cent; and other nations in proportion down to .21 per cent for the smallest. The budget for next year is 20,750,000 gold francs, 500,000 francs less than last year.

Registration of Treaties.—An effort was made to modify the article requiring the registration and publication of treaties in such a way that technical agreements, such, for example, as those in an alliance for military defense, would not have to be made public. This proposal, however, was left to a committee for report at the next session; and it was decided that in the meantime all treaties must be published.

Report of Armaments Committee.—The report of the Armaments Committee recommended that all members be requested to furnish data regarding armaments and appropriations for war material, military, naval, and aerial, for the years 1913-1921, with a compilation of their laws relating to armaments. It was further recommended that the Permanent Armaments Commission should continue its study of disarmament and present at the next session a plan for general limitation of armaments in the form of a draft treaty. The Assembly decided that immediate steps toward disarmament could be better considered by the major powers at the Washington Conference.

No Action in Bolivia-Chili Dispute.—Bolivia finally withdrew her demand that her dispute with Chili be taken up by the Assembly. A committee of the Assembly decided that the Assembly had no competency to discuss the revision of the Bolivia-Chili Treaty of 1904.

White Slave Convention.—An international convention was drawn up increasing passport restrictions for women and minors, as a means of combating the "white slave" traffic. Upon ratification of this convention by any nation, it becomes effective for that nation.

No Increase in Council.—A proposal was made to increase the present members of the League Council to ten, of whom five should be permanent and five non-permanent. There was a dispute as to whether the additional permanent member should be given to Spain or to some American nation. No change was made; and China, Belgium, Brazil, and Spain were again accorded representatives in the Council.

Amendment of Blockade Clause.—Article XVI, regarding economic blockade against a member resorting to war in violation of the league covenant, was slightly amended in such a way that it was left to the Council to decide when such a blockade should be instituted. The Council was also given power to release any member from the obligation of joining the blockade, if in the opinion of the Council such action would be ineffective or would result in loss or inconvenience to the nation.

Article X not Changed.—The proposed elimination of Art. X, guaranteeing members against territorial aggression, was left until the next session. It was the general agreement of the Assembly, however, that the article should not be so interpreted as to make its enforcement compulsory upon all members, nor was it intended as a guarantee that boundaries should remain forever unchanged.

AMERICA ANSWERS LEAGUE NOTES.—At the close of September the Secretariat of the League received from the United States Government fourteen notes briefly acknowledging League communications. These notes were dated at various times in August, 1921, and were in reply to communications from the League dating as far back as February 4, 1921. Criticism appeared in the press over the alleged failure of the United States to acknowledge or take action on League communications relating to mandates, reconstruction of Austria, opium and white slave traffic, and other international matters.

GERMANY

GERMAN-AMERICAN TREATY RATIFIED.—At the close of September the German Reichstag ratified the peace treaty between Germany and the United States. The U. S. Senate at the same time agreed to limit debate so that the question of ratification should come to a vote in October.

STRONGER GOVERNMENT COALITION.—Berlin, Sept. 21.—A sharp tactical turn to the right made by the Social Democratic Party, still Germany's numerically strongest party, at the Goerlitz convention by an overwhelming four-fifths majority vote makes it practically certain that the German People's Party will enter Germany's present coalition government and that the Social Democrats will re-enter both the German and Prussian governments.

Hence composed of the German People's Party, the Democratic Party, the Catholic Centre Party and the Social Democratic Party, the Government of the Republic will be established on the broadest Parliamentary basis since the outbreak of the revolution, leaving the extreme reactionaries and radicals—to wit the German National Party and the Independent Socialist Party—out in the cold of a weakened opposition with the dwindling Communists a neglible quantity.

The impending entry of the German People's Party into the coalition and the switch to the right by the Majority Socialists will give a decidedly reactionary complexion to Germany's next government, and it weakens correspondingly Wirth's position as radical leader.—*N. Y. Times* 21/9.

AUSTRIA AND HUNGARY

Early in October, in response to an Allied ultimatum, the Hungarian Government signed a protocol handing over Burgenland in western Hun-

gary to Austria, in accordance with the Treaty of Trianon. In the meantime, however, Hungarian irregular forces in possible strength up to 30,000 held the district in defiance of the authority of the Interallied Mission at Oedenburg, and prevented Austrian occupation.

GREAT BRITAIN AND IRELAND

INVERNESS CONFERENCE ABANDONED.—To Premier Lloyd George's proposal for a conference at Inverness on September 20, the Irish leader, Mr. de Valera, replied accepting the invitation, but setting forth that Ireland had declared her independence and that her delegates would come "only as representatives of that state." The British Premier replied that negotiations would be impossible on the basis of the formal statement in Mr. de Valera's letter, since there would be an official recognition of Irish independence, and, therefore, an act of treason.

CONFERENCE ON OCTOBER 11.—Following a further exchange of telegrams, the British Government extended another invitation to the Irish delegates "as spokesmen of the people you represent, with a view to ascertaining how the association of Ireland with the community of nations known as the British Empire may best be reconciled with Irish national aspirations." This invitation was accepted in a brief note. Mr. Arthur Griffith headed the Irish delegation of five in all. The British conferees included the Premier, Lord Birkenhead, Sir Hamar Greenwood, Austin Chamberlain, Winston Churchill, and Sir Lansing Evans.

RUSSIA

RUSSIA AND GERMANY RENEW RELATIONS.—Riga, Sept. 21 (Associated Press).—Official relations between Germany and Russia were reopened at Moscow Monday, when the representative of Germany, Professor Wiedenfeldt, presented his credentials to M. Kalinin of the Soviet Central Committee and a note to Nikolai Lenin, President of the All-Russian Central Executive Committee, at the Kremlin, says a radio dispatch received in Riga this evening.

According to Moscow sources, Russia assumes that, with the arrival of Professor Wiedenfeldt, Germany will greatly extend her commercial relations with Russia. This view is generally held also by neutral and American observers in the Baltic States, who foresee Germany, and not England, for the present playing the leading rôle in Russian trade.

It is stated that on all sides Russia, the Bolsheviki and the anti-Bolsheviki alike agree that at present Russia has little to offer in exchange for goods; but it is considered equally evident that most nations, except the United States, are officially going in for future prospects in the country.

Italy is the latest of these countries. Dr. Bogiano Pico, a trade delegate of the Italian Government, having arrived in Riga on the way to Moscow. He is authorized to conclude a Russo-Italian trade agreement, the main outlines of which already have been prepared in Rome by M. Vorovsky, the Russian representative there.—*N. Y. Times* 22/9.

RED PROPAGANDA CHARGED BY BRITAIN.—On September 20 it was announced that Great Britain had sent a strong protest to the Soviet Government alleging propaganda and political activities, especially in India

and Afghanistan, in violation of the trade agreement. Russia's reply on September 26 was a general denial.

SETTLEMENT WITH POLAND.—On September 15 Poland sent an ultimatum to the Soviet Government demanding fulfilment of the Treaty of Riga before October 5. On October 6 it was announced that an agreement had been reached according to the terms of which the Soviet Government promised to begin at once the return of art and other historic treasures to Poland, and to make the earliest possible payment of the first 49,000,000 gold rubles due Poland under the treaty, the payment to be made in raw materials.

LEAGUE BARS FAMINE RELIEF.—On September 30 a committee of the League of Nations Assembly reported unfavorably on the plan presented by Dr. Fridtjof Nansen proposing that nations in the League advance £5,000,000 for Russian relief. The unfavorable report was due to the refusal of the principal governments to extend credits.

The International Commission of Relief for Russia, with representatives of eighteen countries including Germany, met at Brussels on October 6, under the presidency of M. Delacroix of Belgium. The commission expressed preference for the American plan of relief as compared with that arranged by Dr. Nansen. According to a Russian estimate, the present harvest yields two billion poods (36 pounds) of grain, of which half a billion is required for planting, leaving a shortage of about 50,000,000 to be supplied to avert famine.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,
Commander, U. S. N., Secretary and Treasurer.